



**STUDIO JEWELLERY PROCESSES FOR THE POST CYBER DESIGNER**

by

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**Dissertation submitted in fulfilment of the requirements for the degree**

**Master of Technology: DESIGN**

**in the Faculty of INFORMATICS AND DESIGN**

**at the Cape Peninsula University of Technology**

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**Cape Town**

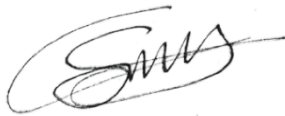
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## ABSTRACT

The cyber revolution has emphasized the dialogue regarding perceptions of value between the mechanically produced and the handmade jewellery piece. The application of modern digital design technology with traditional methods of working by hand in the studio jewellers' practice raises questions of authorship, authenticity, and craftsmanship. The problem is the synthesis of these opposing aspects and components in a post cyber society Studio Jewellery industry. The study investigates the possibility of mitigating the problems with the development of a new framework for the design and manufacture of handmade jewellery in the post cyber society.

Literature reveals that in the current digital age, technology is developing at a rapid pace which in the future could lead to manual jewellery design and manufacturing processes being eliminated (Pettersson, 2019). To date, however, there are no jewellery making processes that exclude manual labour entirely. The rapid development of technology could impact the future sustainability of the studio jeweller in their ability to remain viable in terms of price, time, material consumption, variety and complexity of design afforded by digital processes (Adamson, 2007:21, Fuchs, Schreier, & Osselaer, 2015:100, Hashim, 2018:24, White, 2004:10).

The study was conducted in the greater Cape Town (South Africa) area using a participatory action research method based on an iterative reflective cycle. Participatory action research allows for the parties most affected by changes in the industry to participate in finding a proposed solution. In this research, participants explore the incorporation of digital design technology into the studio jewellery design and manufacturing process of bespoke jewellery. The research aimed to develop a basic framework to find the balance between technological advancement and mass production and the continuity of tradition and the function of the Studio Jeweller in the jewellery industry.

The findings of the two cycles of research identify the current processes of studio jewellers. Participants identified tools that have value in the creation of authentic

handmade jewellery and established the parameters that would ensure the authenticity of handmade within the digital process. The second cycle of research developed a framework for the application of digital technology in the traditional process of handmade jewellery. This framework can be applied to the ever-changing digital landscape in its infinite possibilities. The updated framework will assist Studio jewellers to consider a wider range of technologies whilst retaining the authenticity of traditional bespoke jewellery in a post cyber society. The knowledge gained by the study has a direct bearing on the education of Jewellery design and the development of future curricula.

**Keywords:** jewellery design processes, digital jewellery design, studio jeweller processes, jewellery design education



## ACKNOWLEDGEMENTS

### **I wish to thank:**

- Monica Di Ruvo for all her guidance, patience and valuable advice.
- Boudewijn Smuts, my amazing husband for always believing in my abilities even when I start to doubt.
- D.R.A.W. for being a weekly source of inspiration and motivation.
- Participants, without whom the study would not have been possible.
- My friends, family and co-workers for their support.

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## GLOSSARY

<b>Terms</b>	<b>Definition</b>
Cyber-Physical System	An integrated mechanism that is controlled or monitored by computer-based algorithms mainly focuses on complex interdependence and integration between cyberspace and the physical world. The rise of the cyber-physical system is the key component of the fourth industrial revolution (Chen, 2017:4). From a jewellery perspective, Direct Acrylic Graphs, created and customized in cyberspace using algorithms of parametric design methods, is one example of a cyber-physical system (Demarco, Bertacchini., Scuro, Bilotta, Pantano,2020:431).
Designomics	A term combining the two concepts, design and economics. "The value of a particular design is determined by the theories of the economy."(Hashim, 2018:24)
Digital Design Technology	Digital design technologies is a blanket term referring to computer-aided design software, hardware and technologies used to create design-related products (Lico, 2014:37). Digital design technologies software refers to the programs used to create the designs such as Rhinoceros and matrix and the technology-based techniques used to create them, such as Additive Manufacturing (AM), Direct Metal Laser Sintering (DMLS) and Selective Laser Melting (Dean & Niedderer,2016:52).
Handmade	Refers to the traditional relationship between tool, hand and material to create a product (Patterson, 2019:4).
Hyper-consumerist	Cultural phenomena of unsustainable consumption of nonessential products by consumers (Salvia, Ostuzzi, Rognoli, & Levi, 2010)
Post Cyber	Post cyber refers to when cyber-physical systems have been integrated successfully in making and creating, assisting and supporting in the making and creating of craft 4.0 (Ziegler, 2020:80).
Studio Jeweller	The Studio Jeweller can also be known as an Independent jeweller; an artist jeweller. The studio jeweller is the designer and manufacturer of bespoke jewellery pieces customized to each client's needs. Studio Jewellers also create capsule collections of bespoke artistic jewellery pieces (Untracht, 2011:13).

## ACRONYMS

<b>Acronym</b>	<b>Definition</b>
CAD	Computer Aided Design
CAM	Computer Aided Manufacturing
PAR	Participatory action research



## 1. CHAPTER ONE

### INTRODUCTION

Jewellery has been defined as a discipline where specialist knowledge and practice are applied to the conceptualising and making of jewellery products (Newman, 2015). The jeweller learns their craft through tacit knowledge and practice, traditionally through a system of passing down knowledge, gained through experience, from one generation to the next (Orlandi & Erkan, 2015:1). The jewellery industry is expansive with multiple sectors. This research is focused on the artisanal, a bespoke jewellery field that is mainly based on artisanal craft and traditional skills. The industry was founded in traditional methods of doing, however, at the same time, it has evolved as an industry that has adopted new processes and methods and engaged with industrialization in some aspects (Orlandi & Erken, 2015:9).

In this dissertation, I explore possibilities of how this tradition-based industry could further evolve and grow with the integration of technology in a studio-based practice. The study is delineated to the greater Cape Town (South Africa) area, with ever-growing studio jewellery or artisanal practice culture. The study is focused on studio-based jewellers or artisanal jewellers. A studio jeweller is defined as an artisanal craftsperson who designs and manufactures bespoke pieces of jewellery. Designs are underpinned by the individual design aesthetic of the designer and the personalized requirements of the consumer (Untracht, 2011:13). These designers create limited design ranges that encapsulate their unique style or focus on one-of-a-kind wearable art.

#### 1.1 Background to the research problem

As we engage with the fourth industrial revolution and the rapid changes to the design industry landscape, the future of the Studio Jewellery designer has become uncertain. “Technological developments are part of that uncertainty and dictate the speed and pace our societies change” (Jiang, Kleer, & Piller 2017:85). In this context, there is an accumulating need for Studio Jewellers to manage and evolve with these changes.

In the current age of advanced technology, framed by values of contemporary society, the designer needs to determine how to approach the contrast between continuity of traditions, technological advances and innovation and harness their combined energy for future

generations (Fuchs, Schreier, & Osselaer 2015:98). The perceived qualities of handmade and the parameters of what is considered handmade should be redefined in the post cyber revolution market. The turn to the post cyber market is described by Ziegler (2020) as a continuous beta in which the co-existence of different positions merge.

The studio jeweller designs for the consumer that perceives handmade jewellery as more valuable than digital technology-based manufacturing. The craft movement and society in general associate the “handmade allure” of an item with the familiar alternative in a world where the sterile perfection of technology is replaced by simple tools and the imperfection of the hand (Orlandi & Erikan, 2015:2). Handmade objects are saturated with touch which offers a sense of authenticity in an inauthentic world (Norton, 2014:22).

The conventional design process framework is based on the principle of design for manufacture. This principle considers the manufacturing limitations and constraints of a product in the early stages of the design process (Cooper, 2015: 241). With the technology available today designers can create virtually any geometry they can come up with without the constraints of traditional manufacturing (Cooper, 2015:240).

The consumer also needs to be served from an economic perspective. Globally, there has been a rise of the middle-class jewellery consumer, but for the studio jeweller to compete with the globalised market they need to not only supply an authentic handmade piece but also be competitive with pricing. For the studio jeweller to survive they need to cut production costs to stay competitive with mass-produced imported items (Dauritz, Remy & Tochtermann, 2014:2).

The integration of processes that could be adapted to include new technology would serve studio jewellers well in the post cyber revolution society. As such processes would speed up production and cut costs without decreasing the authenticity or quality of the product. Herein lies the paradigm of the studio jewellery designer of the future. How can the studio jewellery design process evolve together with the post cyber revolution society, yet still serve the consumer with an authentic product, which embraces the sustained accumulative value of the handmade effect?

## 1.2 Statement of the research problem

The cyber revolution together with the advancement of technology it produced, has profoundly influenced the broader jewellery industry in both manufacturing and design processes. The cyber revolution has highlighted the continuous conflict concerning perceptions of value between the mechanically produced and the handmade jewellery piece.

The term contemporary jewellery balances many approaches: for example, practices that emphasize the artistic agency of the maker, and place all the focus on the object as an autonomous work of art; and practices that treat contemporary jewellery as an opportunity to create interactions between people or to intervene in contemporary life from what we might call a jewellery point of view. (Skinner, 2013:15)

The combined application of modern digital design technology with traditional methods of working by hand in the traditional studio jewellers' practice raises questions of authorship, authenticity and craftsmanship. The problem is the synthesis of these opposing aspects and components in a post cyber society studio jewellery industry. The studio jeweller primarily designs bespoke pieces of jewellery for the consumer who attaches a perceived higher value to handmade jewellery pieces.

How then do studio jewellers mitigate the complexities of incorporating digital design technology into the traditional process associated with the handmade jewellery piece? Finding a balance in technological advancement, mass production and the continuity of tradition alongside the function of the studio jeweller in the jewellery industry has now more than ever become the real challenge. This is particularly the case in an industry that is renowned for slow advancement, but which in the sector of mass production manufacturing has advanced exponentially in the past four decades.

## 1.3 Research questions

### 1.3.1 Main question

How does the Cape Town studio jeweller mitigate the complexities of incorporating digital design technology into the traditional process associated with the handmade jewellery piece?

### 1.3.2 Sub-questions

The two sub-questions are narrower questions that will provide the necessary information to address the main research question.

#### 1.3.2.1 Sub-question one

What are the processes currently used by studio jewellers in the greater Cape Town area?

#### 1.3.2.2 Sub-question two

To what extent can digital technology tools be incorporated in the design and manufacturing process of authentic handmade jewellery?

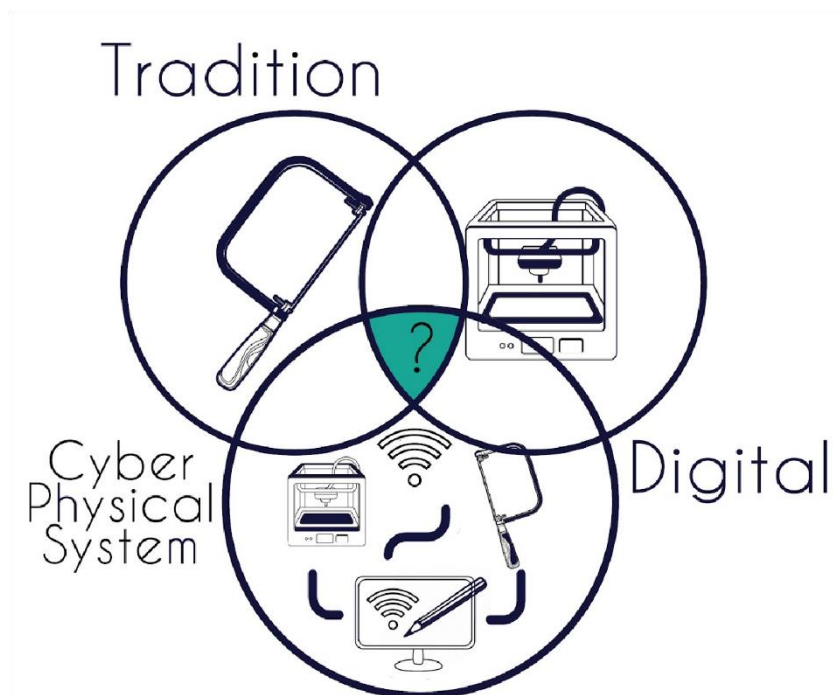


Figure 1.1 Diagram of the assumed integration of the traditional, digital and cyber-physical system processes in the Jewellery context (Greeff, 2020).

## 1.4 Research aims

This research aims to explore appropriate methods for digital design technology to be incorporated into the Studio Jewellery design and manufacture process of authentic handmade jewellery. The aim is to assist the studio jeweller in the greater Cape Town area to create jewellery with a designomic approach while serving the consumer. The research is aimed towards the development of a basic framework for the appropriate application of digital design technology in the handmade process.



*Figure 1.2 Derived inputs from each existing production method that could contribute to the new process of making and creating (Greeff, 2020).*

## 1.5 Objectives of the research

The objectives of the research are as follows:

- i. Provide an improved understanding of the Studio Jewellery sector today and how it might evolve in the future directed towards establishing a basis to identify and develop new processes for the Studio Jeweller in the post cyber revolution market.
- ii. Determine what the role of the Studio Jeweller is in the post cyber revolution market.

- iii. Mitigate the perceived conflict between traditional practice and digital design technology in improved and modernised Studio Jewellery design and manufacturing processes.

## **1.6 Role of the researcher**

The research is a culmination of my interests and influences gained through my Bachelor of Technology in Jewellery design degree, my work as a computer-aided designer (CAD) in Industry and subsequently my career as a High School design teacher and freelance CAD Designer. My interest in the development of new processes developed from challenges observed in the current studio jewellery industry and my love for the traditional processes that are still employed and taught in the jewellery industry.

The traditional processes have immeasurable value, yet they have become costly and in some instances outdated and replaced by more efficient practices. My role as the researcher is to identify and explore how to integrate traditional techniques and processes with modern technologically advanced processes. The integration should provide a way to assist Studio Jewellers to continue with the production of authentic handmade jewellery.

## **1.7 Delineation of the research**

The study will examine the processes currently employed by Studio Jewellers in the greater Cape Town Area. In this study, I will focus on the processes required to create bespoke jewellery. I will explore the technology accessible to the Studio Jewellers of Cape Town for inclusion in new processes. The study could include processes that are commonly applied for mass-production that could be applied to bespoke pieces of jewellery in a studio setting.

To establish the context of the Cape Town (South Africa) jewellery industry, a look at the annual report of the Jewellery Council of South Africa (2019), provides an overview of the jewellery industry in South Africa. The report indicates 239 members which are comprised of manufacturing jewellers, CAD designers and technicians and contemporary art jewellers (JCOSA, 2019:08). My research is limited to the greater Cape Town area which is made up of

a portion of the 239 members. The Cape Town jewellery industry has a strong manufacturing footprint with large companies like Shimansky, Jack Friedman and Grand diamonds situated in the central business district. The contemporary studio jewellery industry is vast with studio jewellers in almost every suburb according to a google search. The delineation of the study to the Cape Town area will be transportable to other metros in South Africa.

## **1.8 Significance of the research**

The literature review determined that the definition of handmade has changed significantly in a post cyber society (Fuchs, Schreier, & Osselaer, 2015). The technology we engage with changes our society and creates the need for change (Jiang, Kleer, & Piller, 2017). An explorative study into what defines something as handmade in the post cyber revolution society will be done. The results of the study should determine how the incorporation of technology-based processes could be applied to create new processes of jewellery design and manufacturing. The study will document and describe the opinions of professionals today, on what design and manufacturing processes they have successfully or unsuccessfully included in their practice.

The research should benefit the future studio jeweller as follows:

- i. Remain relevant in the post cyber community.
- ii. Assist the Studio Jeweller to stay current with the prosumer and hyper-consumerist tendencies of the post cyber community.
- iii. Remain competitive with the industrialized automated broader industry within a designomic perspective, while staying authentic with the artistic essence of what a Studio Jeweller stands for.
- iv. Benefit design education in the field of jewellery design to inform curriculum development for the next generation of jewellers.

## **1.9 Expected outcomes, results and contributions of the research**

The expected outcome of the research will be an investigation of both current digital technology and traditional jewellery design and manufacturing processes in Cape Town. The expected outcome should result in a framework for the successful application of new processes that retain the authenticity of traditional handmade for the new post cyber society. The new processes should be parallel to mass-manufacture and imported jewellery to help the South African Studio Jeweller enter the market at a competitive price point.

The result of the dissertation should determine the current jewellery design and manufacturing aspects of the industry in the greater Cape Town area. It will identify the processes currently used by studio jewellers and investigate the possibilities of tools and processes. The result from the research could inform curricula in the Jewellery Design field of study about new processes and their efficacy in the industry.

## **1.10 Ethical Considerations**

The research was conducted per the principles of ethical research. The research is aimed at professional studio jewellers who were asked to participate. No vulnerable groups of people were included. Possible participants were contacted and informed about the data that would be gathered and that the information provided would be applied to a Masters Dissertation about the processes of Studio Jewellers in the greater Cape Town area.

The intellectual property of the participants was considered throughout the research. Participants provided informed consent during each cycle of the research and had the option to withdraw or withhold information if there is a possibility of harm to their business (Crouch & Pierce, 2012:68). The participant retains the right to share as much or as little as is comfortable for them and retract information when they deem necessary.



The anonymity of proprietary information will also be upheld and the researcher accepts responsibility for maintaining confidentiality throughout the research process (MacDonald, 2012:46). All participants were documented under pseudonyms and remained anonymous (Pain, Whitman and Milledge, 2011:6).

The participants in the co-design research will be informed about the research design and method in detail. Observations and the examination of documents by the researcher will only be made after permission has been granted by the participants (MacDonald, 2012:45). The data collected during this research is stored and backed up in a password protected google drive folder. Access to this information is limited to the researcher and the supervisor.

## **1.11 Brief outline of the chapters**

The following is a brief outline as to what to expect within the following chapters. Chapter 1 provided an introduction to the study illustrating the background of the research, the statement of the research problem and the research question and sub-questions. I discuss my role as the researcher within the study, the ethical considerations, delineation of the study as well as the study's objectives and outcomes. A snapshot of the research is included in between chapters 1 and 2. The snapshot includes a brief view of this research project. The rest of the research is organised into the following chapters.

In chapter 2, the literature review provides an in-depth overview of the literature available on jewellery processes used currently in various sectors of the jewellery industry. It reflects the societal and economic factors that influence the jewellery design industry, particularly the Studio Jewellery designer. The economic factors to consider in the post cyber society are identified and discussed by Hill (2008) and Hashim (2018). The importance of handmade to the studio jeweller is reflected on by Sennett (2008) and Fuchs, Schreier, & Osselear (2015). The link between production methods and the value of the jewellery created with the production methods was established by Orlandi & Erkan (2015), White (2004), Lico (2014) and Simptani & Barret (2020).

Chapter 3 details the research methodology applied for data collection and analysis. The study is conducted with Schön's theory of reflective (1983) practice as the theoretical lens and participatory action research as the method. Participatory action research was conducted in two cycles of reflective research. This is followed by Chapter 4 which presents the study's findings of the research. The data set was collected through a contextual inquiry of semi-structured interviews with jewellers from the greater Cape Town area. In cycle two a co-create workshop was conducted to test the reflections of the first cycle.


Chapter 5 discusses the study's emerging themes in the findings and provides an in-depth report. The following themes were discussed:

- i. The current practice of studio jewellers
- ii. Authentic handmade jewellery with digital processes.
- iii. The proposed new framework.

Chapter 6 provides a brief overview of the study conducted and presents the conclusion. The study is concluded with a proposed new framework for the inclusion of digital tools in the production of authentic handmade jewellery. The framework was developed from the data gathered during the two research cycles. The chapter is concluded with recommendations for further research. The third cycle of research is proposed to test the framework developed during this study.

Table 1 Masters Dissertation snapshot (Aheto, 2017) compiled by Greeff, 2020.

Title:	Studio Jewellery processes for the post cyber designer
Aim:	Explore the integration of new tools in the traditional jeweller's practice of handmade jewellery.
Research Question:	How does the Cape Town Studio Jeweller mitigate the complexities of incorporating digital design technology into the traditional process associated with the handmade jewellery piece?
Research Design:	Participatory Action research: Literature review, contextual inquiry, co-create workshop
Philosophical underpinning:	
Paradigm	Interpretivism
Ontology:	Reality is subjective and driven by society and social constructs.
Epistemology:	The inquirer in the inquiry is interlocked in an interconnected process. The practice by which professionals are made aware of their implicit knowledge base and learn from their experience.
Axiology:	The researcher acknowledges the biases of an interpretivism approach. The researcher is a part of the concept being researched, therefore the views and opinions of the participants and interviewees alongside the literature are highly valued in the contribution of knowledge.
Theoretical lenses:	Schön's theory of reflective practise

Objectives	Sub-Question	Literature Review	Methods	Results	Recommendations
Establish what the literature views as important factors of handmade jewellery.	How important is handmade to the studio jeweller?	<p>Importance of handmade for the studio jeweller:</p> <ul style="list-style-type: none"> <li>Handmade effect (Fuchs, Schreier &amp; Osselar, 2015:107)</li> <li>The intrinsic value of handmade (Lico, 2014:32)</li> <li>Authenticity lies in the skill/craft (Woolley &amp; Niederer, 2016:160)</li> <li>Knowledge requirement of digital (Bernabei 2014:18)</li> </ul>	Literature Review	<p>Blurred lines between handmade and machine-made</p> <p>No process excludes human involvement</p> <p>Overlap between handmade and machine-made</p> <p>Digital tools require the same level of skill as traditional techniques.</p>	<p>Authors indicate that tools available <u>should be assessed and evaluated according to the following:</u></p> <ul style="list-style-type: none"> <li>Historic value</li> <li>Handmade allure</li> <li>Designomics</li> <li>Autonomy</li> </ul> <p>(Hashim, 2018:24; Fuchs, Schreier, &amp; Osselaer, 2015:100; Adamson, 2013:21; White, 2004:10)</p>
Determine what the position of the Studio Jeweller is in the current market and their approach to new processes.	What are the processes currently used by Studio Jewellers in the greater Cape Town area?	<p><u>Studio Jewellers process:</u></p> <p>Theoretical process (Batista, 2012)</p>  <p>Locally defined priorities and perspectives as a</p>	<p><b>Participatory action research:</b></p> <p>Snowball sampling</p> <p>Contextual Inquiry:</p> <p>Interviews:</p>	<p>Interviewees:</p> <p>Three manufacturing jewellers, four studio jewellers, Two specialist service providers</p> <p>Identify the processes that could be considered for inclusion and those that in their opinion cannot.</p> <p>Polarized perspective about the importance of handmade due to consumer perceptions.</p> <p>Digital tools are used by a few for production. Most apply digital tools</p>	<p>Provide the knowledge of what each tool and process can do. Skill development for practising manufacturing designers will bridge the gap.</p> <p>Design should be sculpted with the mouse and not use preset pieces.</p> <p>No preset stones in the wax.</p> <p>Pavé and micro setting should only be mapped and drilled.</p> <p>Complex pieces should be drawn in separate pieces to ensure proper polishing and finishing in the final product.</p>

		<p>transportable tool or framework (Stewart, 2014:4).</p> <p>Designomics: The cost of a design vs the value as a production factor (Hashim, 2018).</p> <p>Interview guidelines with a conversational approach (Halloway &amp; Jefferson, 2011:9)</p>		<p>during the creation stage.</p> <p>Most technology-based processes are outsourced. Lack of skill and knowledge encourages the distance between handmade and digital.</p>	
<p>Explore new methods and processes for the Studio Jeweller in the post cyber revolution market</p>	<p>To what extent can Digital Technology tools are incorporated in the design and manufacturing process of authentic handmade jewellery?</p>	<p>Design Workshop: Explore processes that include digital technology with an authentic handmade approach that results in a designomic product.</p> <p>The literature suggests that a group of at least 7 participants is necessary for an effective codesign workshop (MacDonald, 2012:43).</p>	<p><b><u>Participatory action research:</u></b></p> <p>Co-create workshop based on a design charrette</p>	<p>Create and develop a process that is appropriate for the future post cyber studio jeweller.</p> <p>The process developed in the design workshop should answer the main research question.</p> <p>Any digital process could be included if applied as a tool and not a process in total.</p> <p>The possibilities of integration are infinite. Possibilities should be tested and evaluated.</p>	<p>Further research and testing to develop the new proposed framework. Test the variations of application of each new pathway. This could assist the studio jeweller to stay relevant. Research flexible higher education programmes to promote continued professional education.</p>

## 2. CHAPTER TWO

### LITERATURE REVIEW

#### 2.1 Introduction

Jewellery design has been defined as a discipline where specialist knowledge and practice is applied to the conceptualising and making of jewellery products (Newman, 2015).

Jewellery design production is a craft learned through tacit knowledge and practice. A system of passing down knowledge, gained through experience, from one generation to the next (Orlandi & Erkan, 2015:1). Understanding the tools at your disposal is the first step towards becoming a craftsman.

A young craftsman just starting out is in a position to evaluate the choice of tools and their position in the workplace, while an advanced worker should be equally motivated to take advantage of the latest developments. (Brepohl, E., 2001:177)

The foundation of a Studio Jeweller is the design and manufacture of bespoke pieces of jewellery. Bespoke pieces demonstrate the individual design aesthetic of the designer and the personalized requirements of the consumer.

This review is outlined by the need to explore existing academic discourse in the field of Jewellery design, to establish a baseline for further research. The inquiry should establish the relevance of the studio jeweller and explore the possible mitigation of the challenges faced by Studio Jewellers in the post cyber society.

The inquiry was initiated by a search for published articles, books and dissertations that investigate the challenges faced by Studio Jewellers. An initial online search was done using Google Scholar, Mendeley, Researchgate and Acedemia.edu using keywords “jewellery design”, “digital craft”, “jewellery processes” and “Jewellery education”. The search was then expanded using the databases available on the Cape Peninsula University of Technology digital library like IEEE Xplore Digital Library, Bloomsbury Design Library, EBSCOhost, JStore, Scopus, Springer link and Klimt02: International Art and Jewellery online.

The preliminary review revealed that jewellery processes in the current post-cyber age are an emerging field. The literature focuses on individual techniques rather than complete processes that include both the design and manufacture of the finished product. The list of

titles was inserted onto a spreadsheet to be evaluated. From the spreadsheet I identified which titles to include and which titles to exclude. Inclusion was determined by relevance to jewellery design and manufacturing processes and digital processes in jewellery for the post cyber society. Twenty-six articles were selected for inclusion based on their relevance to the post cyber jewellery industry.

I reread the articles and compiled and categorised the information into the following topics:

1. History jewellery design processes
2. Importance of handmade for the Studio Jeweller
3. Blurred lines between handmade and machine-made
4. Designomics
5. Autonomy

The topics that emerged provide an in-depth overview of what literature is available on jewellery processes used currently in various divisions of the jewellery industry. It elaborates on the societal and economic factors that influence the jewellery design industry, particularly for the Studio Jewellery designer.

## **2.2 Emerged topics**

### ***2.2.1 History of Jewellery design processes***

The history and production processes of jewellery are documented back to the very earliest societies when humans have felt the need to adorn their bodies for religious status and various other intentions (Untracht, 2011, pg xviii). Ancient Egypt and Mesopotamia made technological advancements that served as a stepping stone that influenced the foundation for modern jewellery as we know it today such as the ability to forge copper and bronze. They developed techniques for hard soldering and granulation (Troalen, Guerra, Tate & Manley, 2009:118) which facilitated the making of jewellery designs featuring complex iconography, which previously was not possible. Engraving and filigree techniques are seen

in Mesopotamian jewellery as early as 2500BCE (Gregoretti, 2019:3). Gold became the primary decorative material during the Greek Mycenaean civilization. (Lico, 2014:10) The Hellenistic period saw the refinement of techniques which resulted in detailed cameos and intricate diadems (Pinckernelle, 2007:3).

As society developed technology and diversity in the use of different materials, the skill of the metalsmith was increasingly more prominent. A system of education where skill was passed on from one generation to next evoked the creation of the goldsmith, a specialist maker of jewellery and decorative utensils out of precious and semi-precious metal like gold, silver, copper, bronze and iron (Brepohl, 2001:14). This education system is also referred to as the concept of tacit learning (Orlandi & Erkan, 2015:2).

The development of coinage and the stamping of patterns into a surface dates back to the seventh century before the common era (BCE) (Harrison, 2010:131). The techniques developed for stamping was utilized by both eastern and western cultures. The Middle Ages gave rise to developed techniques such as enamelling and filigree to obtain intricate arabesques jewellery pieces due to the development of specialized equipment (Gregoretti, 2019:11).

The Renaissance during the 15<sup>th</sup> and 16<sup>th</sup> centuries saw a rise in the Goldsmith and apprentice relationship, and the development of guilds (Prins, 2009:191). Most of the techniques, such as forging and fusing, used in traditional hand manufactured jewellery was developed and established by the fifteenth century. This resulted in advanced workmanship capabilities and a greater appreciation for the artistic value of jewellery (Gregoriotti, 1970). The artistic value of a piece of jewellery became increasingly more valuable than the intrinsic material value. The advancement in science and technology resulted in improved stone cutting and polishing abilities (Prins, 2009:191).

The Industrial Revolution gave rise to the new materials for costume jewellery and the capability for mass production. New technology led to the development of electroplating techniques (Prins, 2009:192). The advancement in technology opened up the market for jewellery to a larger portion of the population. By the 20th century, jewellery evolved into an autonomous art form. Whereas before it was seen as a status symbol, now the wearer



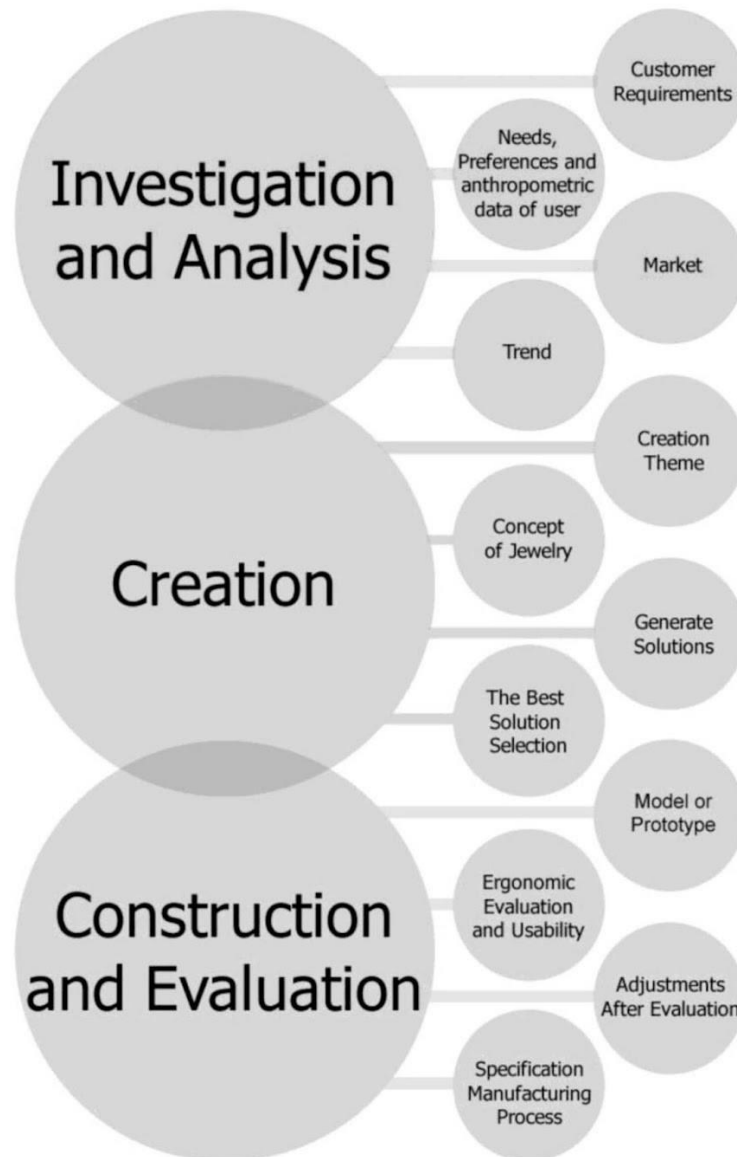
obtained it as a form of stylistic expression (Adamson, 2018:21), with the intrinsic value has become more important to the consumer than the material value of the piece.

The jewellery industry can be viewed as a field mainly based on artisanal craft and traditional skills. However, at the same time, it has evolved as an industry that has adopted new processes and methods. In some aspects, they engaged with industrialization (Orlandi & Erken, 2015:9). The notion of craftsmen working solely for the church or the ruler of a region started to fade with the rebirth of Classicism during the 15<sup>th</sup>-century renaissance. Working with gold and producing gold products developed into an industry by the start of the Industrial Revolution and its drive for competitive business. Modernist notations that developed over the 19<sup>th</sup> and 20<sup>th</sup> centuries encouraged the industrial drive for the rising middle-class societies all over the world, yet the elite would still favour the unique craftsman style of a designer piece. The notion of designer items developed as a rebellion against poorly made mass-produced pieces during the industrial revolution.

Craft should not be viewed as the enemy of modernity, but rather an active partner in the creation of modernity. The craftsman is not superseded by the machine but plays a vital role in the success of the machine (Adamson, 2013:136). The exploration of new manual techniques, the development of existing techniques in other industries and the development of new mass-production methods should all be considered for the development and growth of the field of jewellery design (Forsman & Solitander, 2004). Technologies such as computer-aided design, computer-aided manufacturing, three-dimensional printing, laser engraving and welding bring considerable benefit to the jeweller (Bernabei, Capperellieri & Tenuta, 2015: 2). The craftsman or studio jeweller can access any process, technology or tool required from history for the creation of new designs.

Today's craft practice has access to contemporary traditional practice knowledge, digital technology and small scale manufacturing which creates the possibility of investigating new ways of making, creating and manufacturing in this changing context (Sennet, 2008: 211). Claudia Batista (2012) developed a framework to assist jewellery design students to work in a structured and methodical manner within the contemporary jewellery spectrum. Jewellery design can be described as an activity that involves the researching, creating and planning of production. These activities focus on aesthetics, ergonomics, durability and designomics. The designer needs to complete a complex arrangement of tasks before producing a finished piece (Batista, 2017).

## The Jewelry Design Process Steps are:



The method for Jewelry Design proposed by Batista (2012).

*Figure 2.1 Jewellery design process (Batista, 2012).*

With experience, the designer-maker learns to predict results through empirical experimentation. No two designer-maker products are the same; there are constants in the manufacturing determined by experiential knowledge and not a strict formula. The combination of digital design technology processes with experiential knowledge when applied to new scenarios, allow the maker to venture beyond boundaries. White (2004:11) characterises this as 'technological opportunism'.

The literature indicates that the tools available to the studio jeweller should be assessed and evaluated according to the principles of historic value, handmade allure, designomics and autonomy (Hashim, 2018: 24; Fuchs, Schreier, & Osselaer 2015: 100; Adamson, 2007: 21; White, 2004:10).

### ***2.2.2 Importance of handmade for the studio jeweller***

The jewellery industry consists of various subsectors, namely commercial manufacturing, contemporary-commercial, independent hand jeweller and technical specialists. The larger operations mostly rely on mass-production processes to meet their supply chain demands, but the Studio Jeweller (small to medium based operations) mostly rely on traditional hand manufacturing processes to produce individual or collection artisanal pieces (Patterson, 2019: 3).

Handmade is an effective descriptor for unique jewellery items which are of high quality. These items are predominantly produced by expert craftsmen that specialize in making unique pieces. Handmade can be considered as important as any other hallmark you would find on a piece of jewellery for the consumer. In retail industries, the consumer is what drives the market (Fuchs, Schreier, & Osselaer, 2015:107). For the designer, there is a link between handmade and the theory of emotional design (Moraes, Carrigan & Bosangit, 2017). In practise both the designer and the consumer has an emotional attachment to the piece of jewellery. The designer will leave their mark or aura on the piece (Benjamin, 1998) and the consumer will have a growing sentimental value as the piece is worn on the body (Lico, 2014).

Despite the rise in popularity of high-quality machine-made products, the presence and popularity of handmade products have remained intact across most product categories. Jewellery design is also affected by the Hand-made effect (Fuchs, Schreier, & Osselaer, 2015:107). The handmade effect describes a phenomenon where handcrafted items are viewed as more valuable or desirable than mechanically made products. Western society, in general, perceives handmade jewellery as more valuable than mechanically produced jewellery pieces (Orlandi & Erkan, 2015:6) (Lico, 2014:32), because of the positive value associated with variations and irregularities that occur naturally when producing a product by

hand (Sennett, 2008:149). The manufacturing of handmade jewellery is typically done individually which makes it improbable to create an object identical to another.

Uniqueness and rarity is the appeal of handmade jewellery. This can be evident in small imperfections in the details or the slight differences in shape or form, from one piece to the next. The distinctive feature that resonates with the wearer is ultimately the rarity associated with the handmade jewellery piece. Bespoke designed jewellery is instilled with an individual's value and aesthetic. In the case of jewellery, these objects are kept continuously close to the body (Lico, 2014:32) which creates a sentimental value as well.

The term handmade is also often synonymous with authentic. Authenticity is to be understood as an inherent quality of an object and because it is inherent it is neither negotiable nor achievable (Norton, 2014:18). Authenticity in craft lies within the process and practice of the crafter. The process itself becomes authentic through the designer's unique approach and combination of tools and techniques (Woolley & Niedderer, 2016:160). Authenticity is also associated with originality or one of a kind and when reproduced could lose that unique factor (Benjamin, 1998). That unique factor is what drives the perceptions of value to handmade for the consumer. The perceptions of consumers should rather be steered to understand the originality of concept creation and aesthetics is always created by the jeweller which renders it authentic (Supsomboon, 2019). The making of the product is the second stage in the process of creation (Batista, 2012).

The book 'Jewelry concepts and technology' (Untracht,1982) is considered an instrumental guide to traditional jewellery manufacturing and design processes. The book outlines the traditional systemic breakdown of the jewellery industry and highlights how the various avenues interconnect to the larger whole. The diagram included below illustrates this process. The second half of this diagram illustrates where the Studio Jeweller is positioned currently. In the diagram, they refer to the artist jeweller. The Studio Jeweller could be considered an artist jeweller or an independent jeweller. The studio jeweller or artist jeweller as referred to in the diagram holds a central place within the larger jewellery industry. Studio jewellers are the creative and innovative designers that produce unique pieces that evolve the standard of design within the mass production and costume jewellery markets.

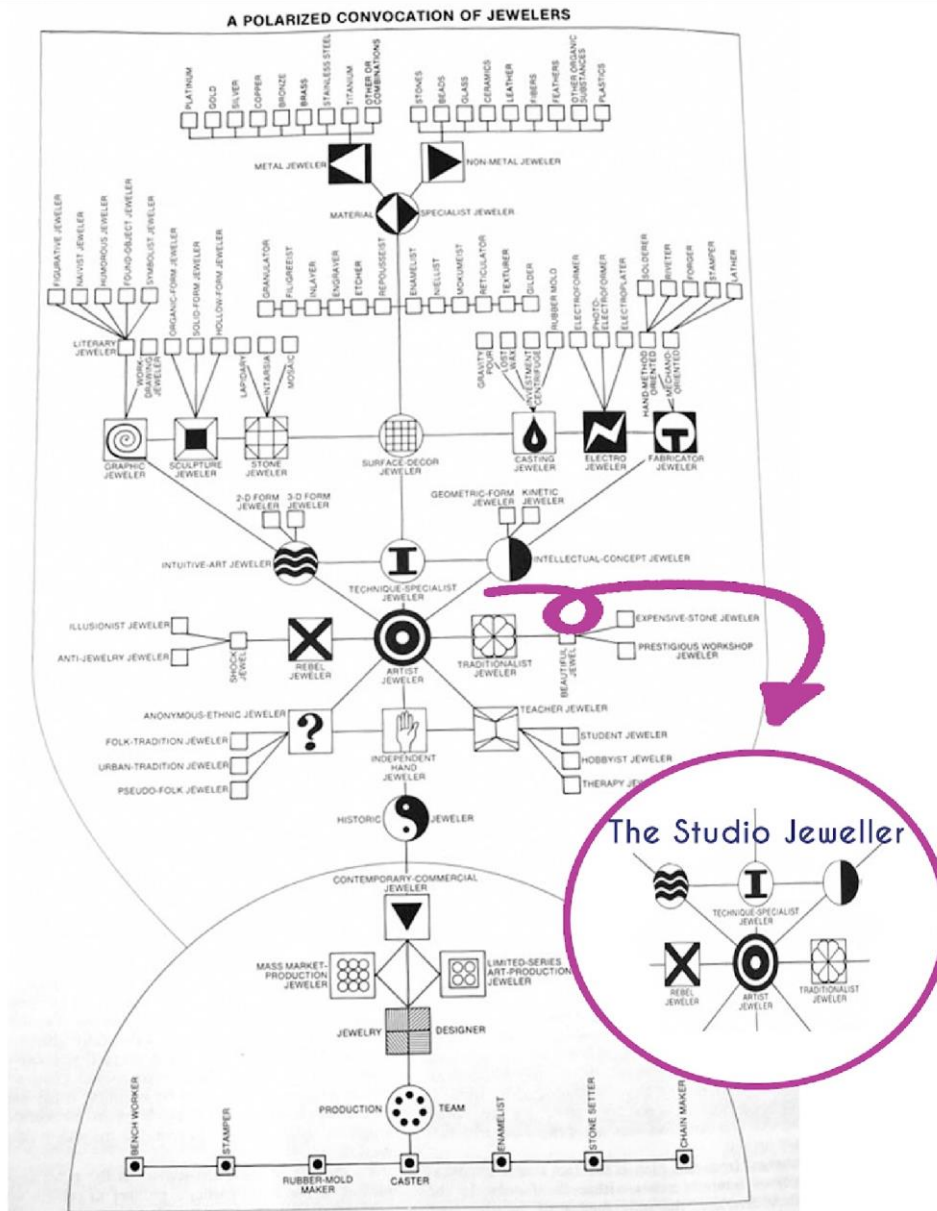


Figure 2.2 A Polarized convocation of jewellers. Adapted by the author to illustrate the sector within the whole, where the studio jeweller is featured. (Adapted from Untracht, O, Jewelry concepts and technology, 2011:12, by Greeff, 2020)

### 2.2.3 Blurred lines between handmade and machine-made

There are almost no jewellery production processes that do not involve machines or technology. A maker of handmade knives will employ a machine to sharpen the blade and the maker of handmade jewellery will use a machine to polish and finish a piece of jewellery. Most mechanical production processes require some form of human involvement. Very few machines operate autonomously. The overlapping interactions of the hand and the machine

make it difficult to objectively categorize a product as completely handmade or completely machine-made. This creates an opportunity for marketing managers to present a product as handmade and justify it as such (Fuchs, Schreier, & Osselaer, 2015:107). The studio jeweller has always relied on the traditional processes driven by expert craftsmanship and practice. Just like the hammer, digital fabrication tools augment the hand of the maker while at the same time introducing specific tool based limitations (Pettersen, 2019: 5). The threedimensional printer only prints what the designer designed, it is controlled by the maker and does not function autonomously. The authorship of the design remains with the designer augmenting the digital tools with their ideas even though the authorship of the design is not what is important but rather the authenticity given to the product by its author of designer creator (Barthes, 2001).

The production of work, using computer-aided design has raised questions of authenticity and control. However, it is an artificial construct, when one considers that a craft maker may equally rely on machine processes, casting and outsourcing (White, 2004:3). When using digital processes, the technology does not function autonomously, it requires the skill and the knowledge of the operator. The jeweller will apply their aesthetic to the design through the machine. The hand of the designer draws the control points of every line in a computer-aided design program, that requires the same knowledge base and practice of skills to accomplish as any other traditional hand process (Bernabei, 2014:18). Digital technology has therefore allowed the line between the hand-made and the machine-made to blur.

#### ***2.2.4 Designomics***

Designomics is the collective term for design and economics (Hashim, 2018: 24). The term describes the economic considerations of a design. The production of a tangible product happens through the design process. In the design process, the combination of theme, concept and ideation are incorporated. The connection and interaction between these conceptual values result in the final product. These values interact according to the parameters set by the client or the market that the product was intended for (Hashim, 2018: 24).

If all the products in the market are essentially the same, then the only thing any customer will care about is price. Once customers only care about price, the market starts bleeding value. (Hill,2018:26)

In conventional jewellery manufacturing processes, the labour cost of a design will be directly linked with the intricacy and complexity of the design. These costs can be reduced with the inclusion of digital manufacturing processes (Cooper, 2015:234). Jewellery products in certain areas of the market have similarities. The cost of producing something unique and of high quality is labour intensive which drives the added value of the handmade label. The engagement ring market is rather restrictive in design, which is where Designomics plays a large role. A similar design can be produced with various methods both traditional and digital in various qualities, the principle of designomics is to determine the best method of producing a design at the market-related price-point with exceptional quality (Hill, 2018:25).

### **2.2.5 *Autonomy***

To design for the mass-production market is to design solely with the consumer in mind. There is little to no autonomy in that process of design. The Studio Jeweller is different in that sense. The Studio Jeweller expresses their authentic artistic views first and the consumer second (Pettersson, 2019:2). The studio jeweller stretches the boundaries of design through experimentation of their inherent practice and technical expertise of craftsmen (Bernabei, 2011).

The design process prior to achieving satisfying jewellery will depend on a designer's understanding of need, science, technical knowledge, creativity, time frame and costing. (Hashim, 2018:24)

The application of digital design and manufacturing tools in the design process will allow the designer to create virtually any conceivable geometry without the restrictive capabilities of conventional manufacturing processes. The inclusion of digital design and manufacturing will also make the complexity of a design and the cost of production independent from one another (Hague,2006:10).

The most prevalent design methods and processes employed today are fundamentally based on the 'design for manufacture' principle. The 'design for manufacture' principle considers the manufacturing of the product as a first step in the design process, whereas the artistic value is usually the first step in the design process for a studio jeweller (Cooper, 2015:236). By combining the ability of handmade techniques with innovative digital design technologies the Studio Jeweller could potentially access autonomous capabilities that will inspire design innovation and still hold the appeal of the handmade effect the consumer prefers (Fuchs, Schreier, & Osselaer, 2015:100).

With experience, the designer-maker learns to predict results through empirical experimentation. The designer, after a few years, can easily predict what the outcome of a process would be and make calculated design decisions in the early stages of the concept development of a design. The designer seeks the balance between originality and the requirements of the consumer within their unique design style (Scarpitti, 2019:71). No two designer-maker products are the same; there are constants in the manufacturing process like clean, well-fitting joints when soldering but the success of that soldering joint is determined by experiential knowledge and not a strict formula. Digital technologies have multiple applications with flexibility that could be utilized with a skill for the highest intrinsic value (Dean & Niedderer, 2016). The combination of digital design technology processes with experiential knowledge when applied to new scenarios, allow the maker to venture beyond boundaries. The literature characterised this as 'technological opportunism' (White, 2004:11).

### **2.3 Conclusion**

The literature revealed that the tools available to the studio jeweller must be assessed and evaluated according to the principles of historic value, handmade allure, Designomics and autonomy (Adamson, 2007:21) (Fuchs, Schreier, & Osselaer, 2015:100) (Hashim, 2018: 24) (White, 2004:10).



In the current digital age, we find that technology is developing at a rapid pace, which might mean that shortly manual jewellery design and manufacturing processes could be eliminated, but as it stands currently there are no processes that exclude manual labour in its entirety (Pettersson, 2019).

In this research, I explore the efficacy of combining the handmade, mechanical and digital processes for the highest quality and intrinsic value. The importance of the continuation of the handmade aesthetic is underlined by the work of Fuchs et al (2015) in which they state that handmade is viewed as more valuable than industry made products. Sennet (2008) reiterates that fact stating that authenticity is found within the imperfections augmented by the hand. The authors Woolley & Niedderer (2016), Pettersson (2019) and White (2004) establish that there is a blurred boundary between handmade and mechanically produced jewellery within the authenticity created by the designer augmenting the digital technology.

Digital design technology like three-dimensional drawing and computer-aided design allows for greater design freedom and autonomy. The autonomy of design will aid the studio jeweller to be progressively authentic in their work and create jewellery pieces of the highest intrinsic value. Digital design technology and production tools could increase the production capabilities of the studio jeweller and lower the labour cost on intricate design without a loss in intrinsic value. This was established by Dauritx, Remy, & Tochtermann (2014), Cooper (2015) and Hill (2018).

Table 2.1 provides a visual summary of the literature review. The table summary illustrates an overview of how each article selected for inclusion relates to the topics identified within the data. The emerging themes established the perceived conflict between traditional practice and digital design technology. The conflict is in the perceived value of the jewellery piece that is directly linked to how it came to be for the consumer (Simptani & Barrett, 2020). The consumer's perceptions need to be steered to understand the link between the concepts and aesthetics created by jewellers rather than the production method of the piece to restore the subtle balance between the originality of the designer and the needs of the consumer that the studio jeweller strives for (Pettersson, 2019).

Table 2 Literature review summary table (Greeff, 2021).

EMERGED TOPICS	AUTHORS	TITLES	CONCEPTS
<b>History of processes</b>	Untracht, 2011	Jewellery concepts and technology.	The role of the studio jeweller within the larger industry.
	Orlandi & Erken, 2015	Value creation in jewellery fabrication today: Exploring the interrelations of crafts and innovation through the case of the grand bazaar of Istanbul.	Jewellery process learnt by means of tacit knowledge. Evolution of the industry within the space of the grand bazaar. Processes development.
	Gregoriotti, 1970	The history of jewellery design.	Traditional techniques as we know it today were established by the 15th Century. Progress and development of tools have enhanced the processes.
	Adamson, 2013	The invention of craft.	Craftsman not superseded by machine -Rather plays a vital role in its success.
	Harrison, 2010	Gold science and application	Development of tools enhances the quality and capability of making the field of jewellery design
	Prins, 2009	Gems and Jewellery. The South African Handbook.	The Industrial Revolution gave rise to modern tools and techniques which enabled the advancement of jewellery processes.
	Batista, 2017	A Contribution for Jewelry teaching.	Batista (2012) developed a framework to assist jewellery design students to work in a structured and methodical manner.
	Brepohl, 2001	The theory and practice of goldsmithing.	Young craftsman is in a position to evaluate the choice of tools and their position in the workplace. Advanced worker should be equally motivated to take advantage of the latest developments.
	Rajili, Olander & Warell, 2015	Characteristics of Jewellery Design : An Initial Review	Jewellery practice may also be characterised as positioned between craft and design-based approaches. What are the principles for jewellery design?
	Supsomboon, 2019	Simulation for jewelry production process improvement using line balancing: A case study	Simulation modeling is one of the powerful tools which could be used to analyze problems and study the behavior of production system. The research explores simulations to improve production in jewellery design.

<b>Blurred lines Handmade vs machine</b>	Corti, 2003	Technology is irrelevant to Jewellery Design — or is it ?	We think of jewellery design solely in terms of artistic design, and CAD systems used for jewellery design work from this artistic approach. The growing use of CAD illustrates that technology could facilitate artistic design and speed up the process.
	Fuchs, Schreier & Osselear, 2015	The handmade effect: What's love got to do with it?	No production process involves no machines, but the idea of handmade hold value with consumers.
	White, 2004	Hybrid Practice- Challenging Traditional Craft Boundaries: Authenticity: Anxiety: Autonomy.	CAD enables a new dialogue within practise. On the one hand there are more possibilities.
	Pettersson, 2019	Craft in the age of digital reproduction- a research into digital reproduction and its aesthetics.	Digital fabrication tools augment the hand of the maker.
	Bernabei, 2015	CAD/CAM and jewellery design education	CAD/CAM requires a similar knowledge base and practise of skill to accomplish.
	Manavis, Nazlidou, Spahiu & Kyratsis, 2020	Jewellery design and wearable applications: a design thinking approach	The potentials for reimagining the jewellery products in relation to the Design Thinking Process and CAD-based tools at the same time.
<b>Importance of handmade to the studio jeweller</b>	Fuchs, Schreier, & Osselear 2015	The handmade effect: What's love got to do with it?	Handmade-effect: Handcrafted is considered more valuable than industrially made.
	Lico, 2014	Applying 3D modelling technology to traditional craftwork: Rapid prototyping in artisanal Jewellery making and its impact on the perceived value of Jewellery.	Value increases sentimentally as the piece is worn on the body.
	Woolley & Niedderer, 2016	Real or unreal?-Crafting authenticity in the digital age.	Relevance of Authenticity in the digital age. CAD production raises questions in established understandings of making and of craft in terms of the hand-made and its individuality.
	Simptani & Barrett, 2020	Investigating the use of digital technology in Jewellery Design: A thematic analysis	Consumer perceptions must be steered toward creating the link between the concepts and aesthetics created by the jewellers.
	Sennett, 2008	The craftsman	Authenticity of the handmade process is evident in the uniqueness of the imperfection that the hand augments. The hand is the window on to the mind.
	Norton, 2014	Exploring the Negotiations over subculture Ideology of authenticity within the Etsy community.	Authenticity is understood as the inherent quality of an object and because it inherent it is not negotiable nor achievable.



<b>Designomics</b>	Hague, 2006	Unlocking the design potential of rapid manufacturing.	The use of rapid manufacturing could delink the relationship between complexity and cost.
	Hill, 2018	The jewellery industry's design dilemma.	If all the products in the market are essentially the same, then the only thing any customer will care about is price. Once customers only care about price, the market starts bleeding value.
	Hashim, 2018	Design economic evolution in the jewellery industry.	The value of a particular design is determined by the theories of economy in this influence.
	Cooper, 2015	Sintering and additive manufacturing: The new paradigm for the Jewellery Manufacturer.	Costs can be reduced with the inclusion of digital manufacturing processes
	Dauriz, Remy & Tochtermann, 2019	A multifaceted future: The jewelry industry in 2020	Fine jewelry has so far been immune to the effects of fast fashion, but not the fashion-jewelry market. Studio jewelers to enhance supply chain pace to stay competitive.
<b>Autonomy</b>	Cooper, 2015	Sintering and additive manufacturing: The new paradigm for the Jewellery Manufacturer.	Design for manufacture principle. Venture beyond boundaries of geometry of conventional jewellery making.
	White, 2004	Hybrid Practice- Challenging Traditional Craft Boundaries: Authenticity: Anxiety: Autonomy.	Investigates whether 2D image manipulation software, by 3D modelling hardware is informed by knowledge of production techniques in jewellery. CAD production has raised questions of authenticity and of control.
	Newman, 2015	An illustrated dictionary of jewellery	Jewellery design defined as a discipline where specialist knowledge and practice is applied to the conceptualising and making of jewellery products
	Hague, 2006	Unlocking the design potential of rapid manufacturing.	Expand the possibilities of geometry that is viable for production via the inclusion of rapid prototyping and digital production.
	Pettersson, 2019	Craft in the age of digital reproduction- a research into digital reproduction and its aesthetics.	The jewellery industry is a subtle balance between the originality of the author and the needs of the market.
	Scarpitti, 2019	Singular Multiples: Contemporary Jewellery Beyond The Digital	What the hand tells the Brain: Tool Use, Creativity and Embodied Cognition'. Jewellery making, constraints imposed by the materials used, the tools, the design brief, the aesthetic considerations or historical considerations.

## 3. CHAPTER THREE

### Methodology

#### 3.1 Research design and method

The Conceptual Framework of my research is based on a participatory action research method. Participatory action research is a subset of action research that involves an action researcher and community or organization who aim to solve a problem (MacDonald, 2012:36). Participatory action research was selected because it requires the subject of the research to participate and collaborate with the researcher throughout the entire research process. Participants do not play a passive role, as is the case in other research models (MacDonald, 2012:38). The research seeks to analyse the process of design to articulate it as a transportable or translatable tool. (Stewart, 2014:4). Participatory action research is defined as the stage where most input is engagingly collected from stakeholders with a focus on locally defined priorities and local perspectives (Cornwall & Jewkes, 1995:1667).

The Participatory action research approach is based on the iterative reflective cycle by David Coghlan (Coghlan,2019:11) as illustrated below. The concept of reflective practice was introduced by Schön (1983) and provides the theoretical approach for this research. Schön states that professionals solve problems through tacit knowledge linked to activities, as the studio jeweller has developed their repertoires of solutions in the studio for production and design challenges. Schön refers to the process as reflection which can take place during and after a task for continuous professional improvement. Every cycle consists of four stages that include identifying, planning, acting and evaluate as illustrated in the following illustration. The notion of lifelong learning is recognised as an important skill in fast-changing environments.



*Figure 3.1 Stages of Participatory Action research cycle. Adapted from Coghlan and Brunick,*

My research design is based on the iterative reflection cycle of David Coghlan. The research will include two continuous cycles of inquiry. The results of each cycle will inform the cycle that follows. The illustration in Figure 3.2 maps out the four stages of every cycle.

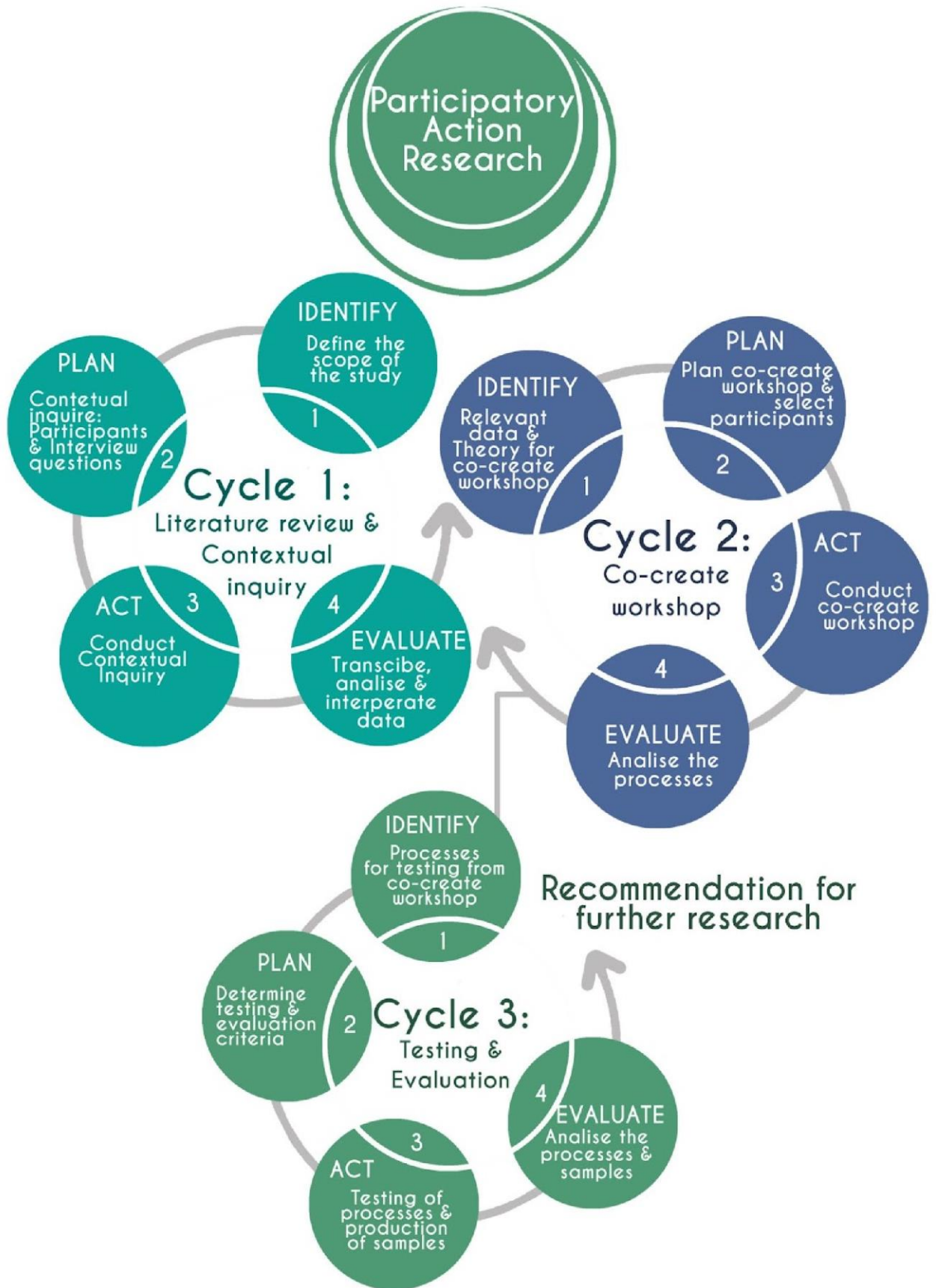


Figure 3.2 Research design and method diagram (Greeff, 2020)

## 3.2 Participatory action research cycle one

### 3.2.1 Method

The first cycle of the participatory action research included a qualitative systematic literature review. A comprehensive search of the literature available on the topic of jewellery design processes and digital jewellery design processes were done and articles were selected for inclusion based on their relevance to the post cyber designer. The literature review defined the scope of the research problem through the knowledge gained by the review. The first cycle aimed to identify the processes that are currently used to create authentic handmade jewellery and establish to what degree they involve digital processes. A contextual inquiry was conducted into new possible technologies and processes that can be adopted by Studio Jewellers in the greater Cape Town area. The new technologies refer to any tool or processes not included in the traditional arsenal or repositories of the studio jewellers practice. A contextual inquiry is a method of data collection that takes place within the space of the subject providing the data (Stewart, 2014). During this research, the inquiry took place in the studio of each jeweller interviewed. This allowed me, as the researcher, to be immersed in the environment of the designer while verbal data is collected. It created a secondary observed data stream to aid the understanding of the researcher into the perspectives of the interviewee or participant.

During the contextual inquiry, I applied the snowball sampling method to identify participants for the study (Parker, Scott & Geddes, 2019:1). The small jewellers' community in Cape Town tends to be closed off to outsiders. The fact that I, the researcher, am part of their community aided with sourcing participants. Snowball sampling is effective in closed structure communities like the jewellers' community (Orlandi and Erkan, 2015:9).

According to the Jewellery Council of South Africa's annual report of 2019, the Jewellery manufacturers association of South Africa has 239 members. The Jewellery Manufacturers Association of South Africa represents manufacturing jewellers, CAD designers and technicians and contemporary art jewellers (JCSA, 2019:08). My research is limited to the greater Cape Town area which is only a small portion of the jewellers represented by the Jewellery Council of South Africa.



Reliability in qualitative research lies in the consistency of the inquiry, using a larger group to sample from will provide a clearer understanding of the whole community (Linhult, 2019:15). Validity refers to the result of the inquiry being grounded in claims of new knowledge (Linhult, 2019:13). To initiate the snowball sampling method, I approached five members of the closed Facebook group, Cape Town Contemporary Jewellers. The participants included manufacturing jewellers, studio jewellers and technology-based specialised manufacturers. I selected five jewellers to contact via email to enquire whether they would be interested to assist in my study. A spreadsheet was drawn up to keep track of who was contacted and who responded. During each interview, I would ask for a suggestion of a jeweller to approach as per the snowball method. In total, I contacted twenty-five jewellers, of these nine were willing to be interviewed.

### **3.2.2 Participants**

Nine jewellers were interviewed during the contextual inquiry. One interview was conducted via Zoom, and the other eight were done in person. The jewellers interviewed included three manufacturing jewellers, five studio jewellers and one technology-based specialised manufacturer. Participants included high-end commission-based jewellers, specialist service providers to the industry, art jewellers who aim to bridge the gap between art and design and jewellers that serve a tourist market

The interview guidelines were predetermined and conducted in a semi-structured manner. The predetermined interview guide was altered during each interview to ensure organic responses from the interviewees or participants. The interviews were conducted in a conversational manner rather than on a question and answer basis (Hollway & Jefferson, 2011:9). The conversational approach and the location of these interviews gave me insight into the interviewees perspective and practice beyond their answers. The interviewees responded in comfort and shared their ideas and concerns with limited apprehension and provided information beyond the scope of the study.

### **3.2.3 Data Analysis**

The interviews conducted during the contextual inquiry were recorded and transcribed. The transcription was uploaded to Atlas-Ti to thematically code and analyse the data (Maguire & Delahunt, 2017). Thematic Analysis is a method of analysis that is used to identify, analyse and record patterns in data (Braun & Clarke, 2006: 79). This method of analysis was applied to highlight patterns within the qualitative data between participants, and the findings are presented in chapter four of this dissertation. This data was applied to the participatory action research cycle two.

## **3.3 Participatory action research cycle two**

### **3.3.1 Method**

A co-design workshop enables the communication between stakeholders and designers, the development of other design tools and prompts to facilitate participant involvement. Codesign shifts thinking away from preconceptions and incentivises innovative scenarios (Stewart, 2014: 4). This method of research is valued in a closed community like the jewellery industry as it allows the community to have a stake in the solution design (Mackewn, 2014). The second participatory action research cycle aimed to apply the data that was gathered and analysed in the first cycle in a co-design workshop. The first cycle of the research was a generative mode of inquiry to inform the development of new processes during the co-design workshop. The co-design space was used to test and analyse the empirical data gathered in research cycle one, during the literature review and contextual inquiry.

The co-create workshop applied a design charrette method (Day, 2003). The charrette is a fast way of generating ideas while involving stakeholders or in this instance the future and current studio jewellers into the decision making. Participants were provided with Batista's (2012) theoretical design process as a foundation to build the new process around. The design charrette allowed the participants to interact with data using a design thinking approach to develop the new framework.

### **3.3.2 Participants**

The participants for the co-design workshop were a selected group identified from the list generated during the 1st cycle. I started by contacting jewellers that were unavailable during the first round to inquire about availability during this round. Participants were invited to take part in a co-design workshop voluntarily. This workshop took place under strict covid-19 protocols and was hosted at a third-party office space. The literature suggests that a group of at least 7 participants is necessary for an effective co-design workshop (MacDonald, 2012:43). The invited participants were requested to confirm their consent for participation in the co-create workshop.

The workshop was conducted with a group of participants made up of two seasoned studio jewellers, two recent graduates in jewellery design and manufacturing, my supervisor and myself, the researcher as the facilitator. Two other participants had to withdraw at the last minute due to covid-19 related reasons.

### **3.3.3 Co-create Workshop**

As the facilitator of the workshop, I introduced the study to the participants. An overview of what had been found in the first cycle and how we would apply it in the co-create session was introduced which gave participants insight into what we aimed to achieve and how we planned to achieve it. The Figure below illustrates the documentation provided to the participants. The full PowerPoint presentation is also included as Addendum A. The findings presented to the participants are illustrated in figures 3.3 and 3.5. The complete findings from research cycle one are discussed in chapter 4.

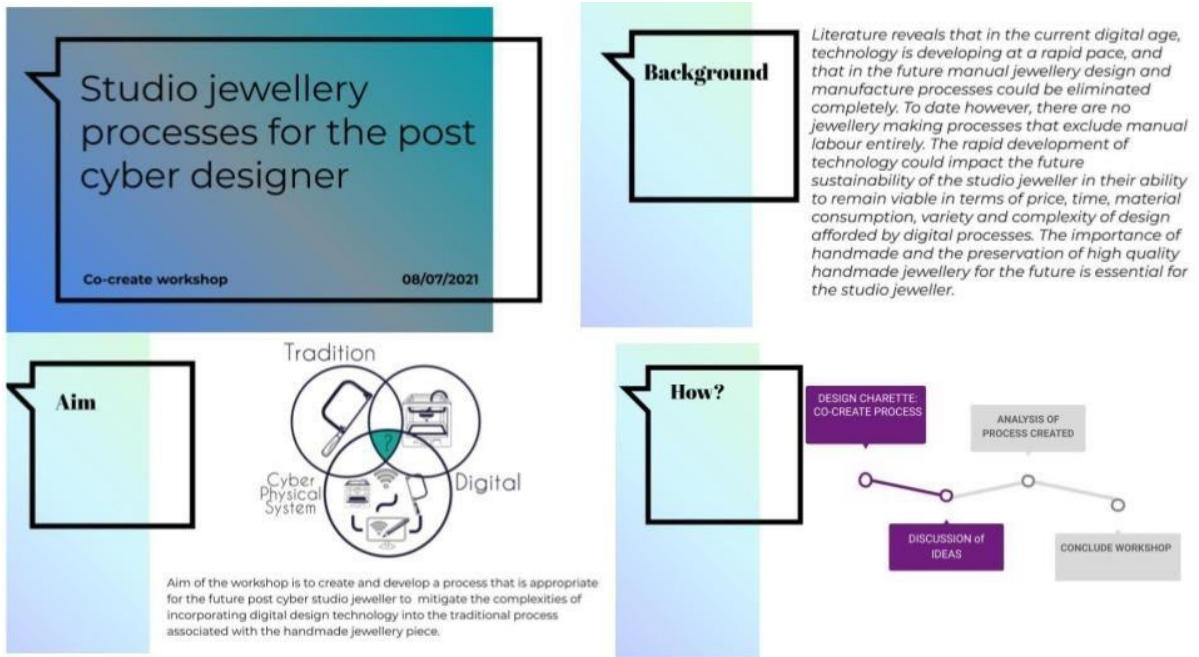


Figure 3.3 Introduction of the Co-create workshop page 1- 4 (Greeff, 2021)

The co-create workshop applied a design charrette method (Day, 2003). Participants were provided with the theoretical design process (Batista, 2012) as a foundation upon which to build the new process.

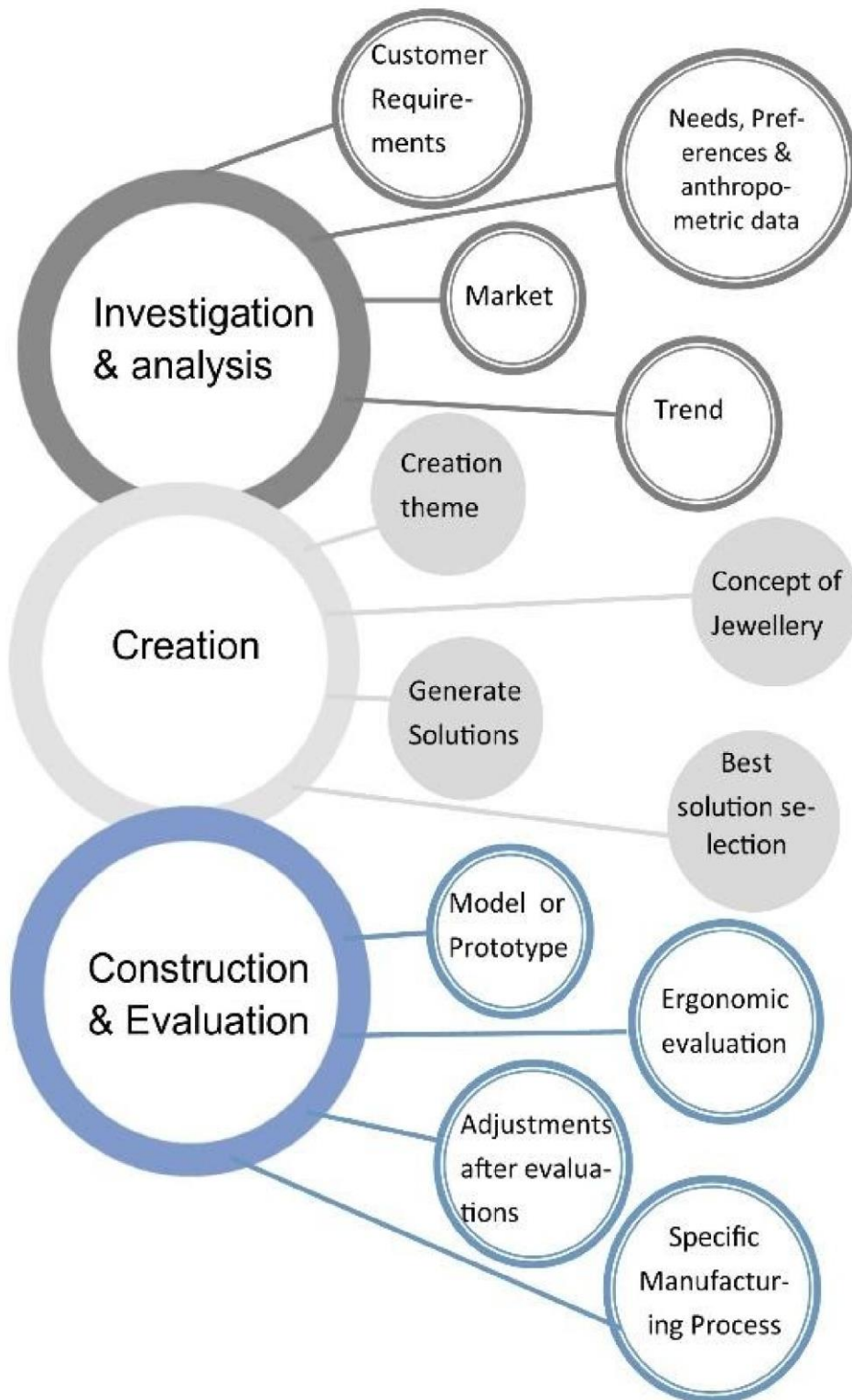


Figure 3.4 Jewellery design process by Batista (2012) (Adapted by Greeff, 2021)

Participants were also supplied with a list of current digital processes and the established traditional process developed from the previous cycle of research. These were discussed as an introduction to the design activity.

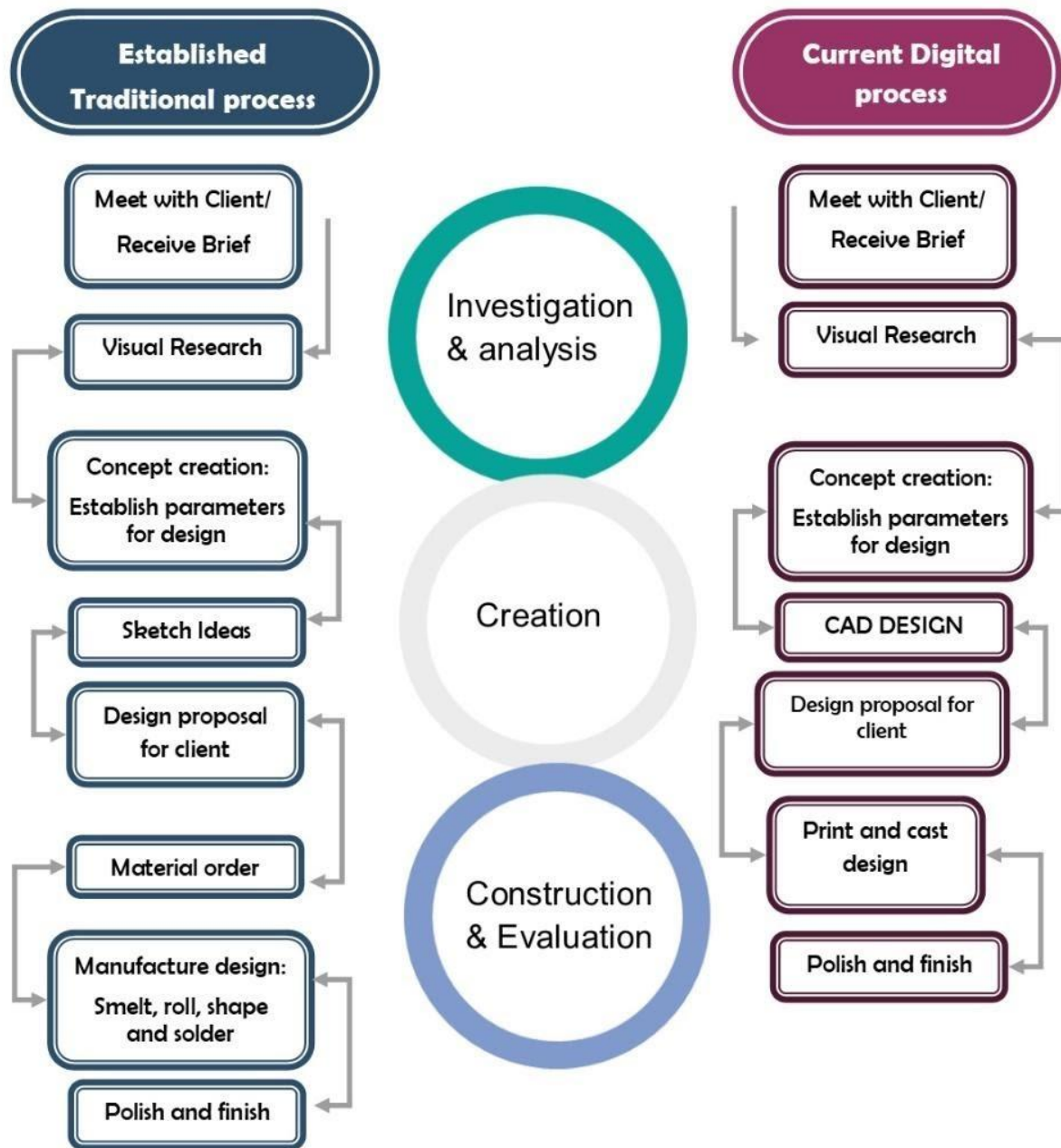


Figure 3.5 The established traditional process and the current digital process (Greeff, 2021).

The participants received a large number of tools and processes on cue cards. Blank cards were available for additional tools and processes not mentioned in the previous research cycles. The participants were also supplied with colour post-it notes and writing instruments. The three stages of the design process were laid out on a large boardroom table.



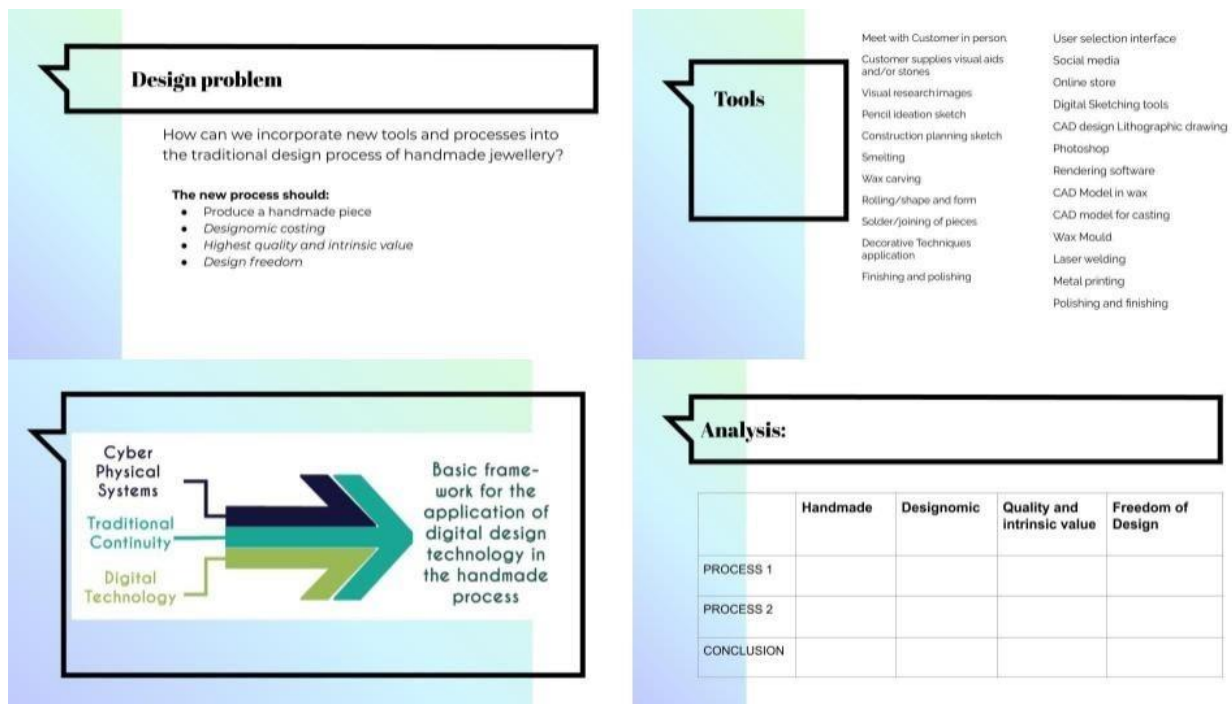


Figure 3.6 Introduction of the Co-create workshop page 5-8 (Greeff, 2021)

The intended outcome of the co-design workshop was a collaboratively developed design understanding that can inform the final development of a designed process to assist Studio Jewellers to expand their knowledge and skills in the post cyber revolution society. The workshop was concluded by a decision to place all the processes as discussed during the workshop on a rubric to be assessed according to the four parameters that a new framework or process needs to conform to.

### 3.3.4 Data

Two data sets were developed during the co-create workshop. The recording of the workshop itself was transcribed alongside the photographic evidence of the workshop. The data was uploaded to Atlas-Ti for thematic analysis. The analysis and coding applied the six-phase approach to thematic analysis (Braun & Clarke, 2012). The first of the six phases is to familiarize yourself with the data. The second phase is to create initial codes. This coding was done in Atlas-Ti. The third phase is to search for themes. Phase four refines the emergent themes. Phase five defined the themes and six delivered the report on those themes. The following table explains how each phase was applied to the data gathered during the co-create workshop.

*Table 3 Thematic analysis outline of the co-create workshop adapted from Braun & Clarke, 2012. (Greeff, 2021)*

Six phases of Thematic Analysis	Description	Application
<b>Familiarize with data</b>	The researcher must be immersed within the data to familiarise themselves. This can be achieved by reading, re-reading and even listening to an audio playback of the data. This is done to ensure that no analytical observations are lost.	The co-create workshop was recorded via Zoom for audio recollection. The notes taken by the author and the photographic data was applied to create a transcription of the workshop. After transcribing the data was read through a few times to familiarise me with the data.
<b>Initial codes</b>	The majority of thematic analysis approaches involves generating labels for important features of research to refer to and create themes. Coding is a simple analytical method of data reduction.	After re-familiarising the data, each stage was assigned a colour code. The processes were grouped within the stage of the design process where they could be applied. Codes were given to data with similar themes.
<b>Search for themes</b>	Themes are meaningful patterns found within data that are relevant to the research question. It consists of all codes collected being built together to make arguments to either validate or differ from the research question.	The use of coding and text colouring aided the search for emerging themes.
<b>Refine themes</b>	This involves validating the themes against the relation of the coded data and the full data set. The researcher can reflect on themes and be able to decide if they tell a convincing story validating the research question.	Emerging discussion points and themes within the data were re-read and reviewed to make for a better flow of reading. This allowed the researcher to review all themes.
<b>Define and finalise themes</b>	During this phase, the researcher is required to write up a detailed analysis of each theme to identify the essence of each theme and in doing so build a concise and informative name for each theme.	Emerging themes were coded and labelled as headings for paragraphs where discussion points and definitions of the theme were written.
<b>Report</b>	The report involves the construction of the analytic narrative and data extracts to tell the reader the story about the data.	Finally, all the key themes were written up to provide a good flow within the Findings chapter.



The second set of data was the analysis of the processes discussed during the workshop. Participants were sent a rubric based analysis tool to evaluate the processes discussed during the co-create workshop. The parameters used to evaluate the processes were determined by the literature review and contextual inquiry, which established that it was important for a new process to uphold the following criteria. It should be considered handmade. The costing of the process should attain a designomic approach. The process should produce products of high quality and intrinsic value and lastly, the process should allow for design freedom.

### Co-create workshop analysis of digital Processes

Please rate each of the digital processes discussed during the workshop out of a value of 10. 10 being excellent in that parameter and 0 being poor for that parameter.

	Handmade	Designomic	Quality & intrinsic value	Freedom of Design
<b>INVESTIGATION &amp; ANALYSIS</b>				
User selection Interface				
Visual online presence: social media, website etc.				
<b>CREATION</b>				
Digital sketching tools_free				
Rendering software				
CAD for casting				
Resin model				
<b>CONSTRUCTION &amp; EVALUATION</b>				
Direct metal printing				
3D printing Wax				
3D printing Resin				
Model casting				
Laser cutting				
Laser engraving				

*Figure 3.7 Analysis rubric of the processes discussed during the co-create workshop (Greeff, 2021)*

Each participant was asked to rate the process discussed during the workshop. All the ratings given to each tool or process were combined in a single rubric to quantitatively establish which tools and processes were rated the highest. This rubric based data concluded the participatory action research cycle two and the co-create workshop.

### **3.4 Recommendation for further research**

The third cycle of Participatory action research is recommended to test the results of the second participatory action research cycle. This cycle would test the processes developed during the co-design workshop. The process will be assessed according to the principles established in the literature review and the contextual inquiry. The analysis will determine to what degree these processes are viable for the studio jeweller to apply to the design and manufacturer of authentic, designomic, jewellery that retains the handmade allure (Fuchs, Schreier, & Osselaer, 2015:100) (Hashim, 2018: 24) (White, 2004:10).

## 4. CHAPTER FOUR

### Findings

In this chapter, I present the findings obtained by the two cycles of research. The chapter starts with a presentation of the findings obtained by conducting a contextual inquiry, thereafter I present the findings from the co-design workshop.

#### 4.1 Contextual inquiry

The contextual inquiry was conducted to establish what processes and technologies are currently applied by Studio jewellers in the greater Cape Town area. Participants for the contextual inquiry were selected through the snowball sampling method (Parker, Scott & Geddes, 2019:1). The process was started by contacting jewellers in the greater Cape Town area from a closed Facebook group called: Cape Town Contemporary Jewellers, of which I am a member. A total of twenty-five jewellers were contacted of which nine were interviewed.

The interview guidelines were predetermined and questions were adapted during the interviews to suit each participant. The interviews were conducted in a conversational manner rather than on a question and answer basis (Hollway & Jefferson, 2011:9). The conversational approach of these interviews gave me insight into the interviewees perspective and practice.

The interviews were conducted in the interviewed jewellers workshop where possible. Due to covid-19 restrictions, some jewellers felt more comfortable being interviewed via video call. The jewellers' identities were kept anonymous for the duration of the study as stipulated by the ethical clearance of the research. They were assigned pseudonyms, for example, jeweller 1 or participant 1 for research cycles one and two, respectively.

### **4.1.1 The jewellers**

During the contextual inquiry, I found it interesting that the niche of every jeweller and how they would describe it was very different. The difference of opinion and foundation in the industry displayed the complexity of the Cape Town Jewellery industry.

Jeweller 1 and Jeweller 8 both considered themselves as high-end jewellers, yet Jeweller 1 was focused on the tourist market and Jeweller 8 mostly relied on the local suburban market. Jeweller 1 works from a traditional jewellery store that carries a wide range of stock as well as the custom manufacture of one-off pieces for clients. Jeweller 8 is a studio-based jeweller that manufactures mainly commission work.

Jeweller 2 and Jeweller 6 were both service providers for the industry. Their niches were aligned with their field of expertise. Jeweller 2 is a well-established hand engraver and professional setter while Jeweller 6 is an expert laser engraver.

Jeweller 3 established a niche in the market, not in design style, but rather in the material source. Jeweller 3 only uses metal retrieved from recycling e-waste, which serves an environmentally conscious client.

Jeweller 4 is an artist jeweller. The niche in the market for Jeweller 4 lies within the customised art jewellery domain, the work is described as something personal to the client and a reflection of a story or journey. Jeweller 4 also established that everything is made in-house by jewellers and by hand.

Jeweller 5 and 7 can both be defined as artist jewellers that bridge the gap between art and design, to create wearable art. Jeweller 5 draws inspiration from beautiful and unique gemstones to create wearable art that can be viewed as an art installation when not worn. Jeweller 7 works from a conceptual approach.

Jeweller 9 was the last to be interviewed and described their role in the market as serving the customer. Removing themselves from the design to create the best possible design and finished product for the client. Jeweller 9 works on a commission basis to create one of a kind pieces for each client.

#### *4.1.2 Handmade jewellery*

The second topic that was discussed was the importance of handmade to each jeweller's practice. The jewellers were asked what the importance of handmade is in their business practice. Most of the jewellers agreed that handmade is of great importance to their business and practice, except for Jeweller 8 and 9. Jeweller 8 used the term in some cases but stated that being a jeweller that applies all available processes is more important. Jeweller 9 stated that they removed the term for their website. Handmade is not the most important aspect to them, they chose production methods based on design and client needs.

Jeweller 1 explained that the term is used alongside custom made. It was differentiated between pieces made by hand from start to finish, and pieces developed from a handmade prototype and cast. They referred to pieces as being custom made when it is developed from CAD, even though the jeweller added that "CAD is still handmade because you have a hand that controls it".

During the interview with Jeweller 2, the questions were adapted to make it applicable to the specialist practice of a setter and hand engraver. Both these processes are done by hand. Jeweller 2 did supply some insight into the percentages of handmade pieces and the percentage of CAD pieces that comes to them for setting and engraving. Jeweller 2 stated that the landscape is changing and that in the last few years he has been setting more CAD pieces than handmade pieces, and that the quality of CAD manufactured pieces has improved significantly.

The next interviewee had a lot to say on the importance of handmade, not only to their business but to the jewellery industry as a whole. Jeweller 3 discussed how handmade on a

very personal level is simply what they do. "Making things is ingrained into who I am", they stated. The importance of handmade was also approached on a socio-environmental level, stating that handmade creates jobs, opportunities and drive where mechanization doesn't. "I think there is a delicate balance to be struck between handmade and hi-tech. So we are still creating various opportunities in various sectors at various skill levels as well as technical skill levels and computer skill levels." In their opinion handmade plays a vital role in job creation in a country like South Africa where most of the workforce do not have exposure to the digital world. The landscape will inevitably change, what is important is how we manage the role that handmade plays in job creation and how the void will be filled. Jeweller 3 explained that job creation is one of the reasons they are so excited about e-waste recovery. The extraction process is manual and labour intensive which aids in creating jobs in this sector while losing jobs in other sectors like mining and manufacturing.

Jeweller 3 also referred to a quote by Aimee Bender (2013) which describes what makes handmade items important to them, the quote reads: "that's the thing with handmade items they still have the person's mark on them and when you hold them you feel less alone." There is something spiritual about handmade jewellery as it engages with the human body, it reflects how we connect to the piece. Though handmade is a luxury that only a few can afford, which is the downside of handmade, the price tag and exclusivity there off.

Jeweller 4 stated that they are an exclusively handmade studio. Each piece is a journey embarked on with the client for the jeweller which refers well to the notion of emotional design (Moraes, Carrigan & Bosangit, 2017). The journey they embark on with the consumer is therapeutic for both the designer and consumer. Together they investigate sentiments of an emotional, personal level to create a bespoke piece of jewellery that captures a memory or feeling. They described that they are in a position to choose which jobs to take, so only projects that interest them. Jeweller 4 also explained that the pieces they make are based on the individual journey of the client and what they went through so each piece is unique and does not reference something available commercially, but rather the memory or loss or emotion the client went through captured in a wearable trinket.

For jeweller 5 handmade is also of utmost importance. They explain: "machines can do things that no human can do, but there is magic to the touch of the human hand". In their opinion not even another hand can create what they do, meaning that the touch of each

person is unique, how each person makes and creates has a signature, and compares it to the brushstroke of an artist. They continue to explain that a machine is a machine and will create beautiful things perfectly but it will lack that magical touch of a human. In the opinion of Jeweller 5, there is magic in the flaws.

The importance of handmade is not relevant for Jeweller 6 from a service provider perspective. Providing specialised services in laser engraving and laser welding, how the product was made is irrelevant. Laser engraving can be done on most surfaces. Laser welding is mostly used on repairs and restoration of jewellery pieces, whether they are machine manufactured or handmade, the techniques and processes can still be applied.

For Jeweller 7 the concept of handmade is very important. They describe how when they initially started the jewellers collective, they would manufacture everything by hand and by themselves. They would get upset when others in the collective did not work as they did. With time they came to realise that it was unrealistic to work in that manner and to encourage economic growth they would have to adapt. Jeweller 7 started to outsource the making of moulds and engraving, to allow for them to create a larger volume of work. Outsourcing ensured that the work was still handmade, but Jeweller 7 had to let go of the need to do everything themselves, without jeopardizing the relationship with their customers, who expect that everything will be made by Jeweller 7. To stay authentic is the most important factor, especially surrounded by artists in the position where they are situated, it is important to be authentic and original and not create generic items. Jeweller 7 describes it as riding a fine line between outsourcing and staying authentic by creating everything in house.

Jeweller 8 thought that today it is not as important to be exclusively handmade as it was ten years ago. Though handmade is still sought after in most cases, there are also situations where handmade does not have the best reputation. For Jeweller 8 his customers need to know that most of their pieces are handmade, but not all of them. For them, it is about selecting the best method for the individual piece. When using CAD even though it could still be considered handmade we would simply leave out that hashtag.

Jeweller 9 explained that handmade is not all that important to their business. The incorporation of technology and mechanical processes was out of necessity to keep the business from plateauing. They explain that after years in the business, you learn to incorporate the things that will help your business grow. For a company that only works on a commission basis, they need to create what the client wants at the right price point, which means that production processes will be selected based on the design, and the client's preference and budget. The inclusion of CAD and casting processes allows for more commissions to be done per month and allows the business to stay sustainable. In their experience, they noted that some clients ask for the handmade look, and they refer to something that is not always well made. We have removed the term handmade from our advertising and website completely as the association in most cases is not that of a high-quality jewellery piece.

#### ***4.1.3 Digital tool application in current practise***

The application of digital technology in their current practises was the next topic of discussion from the nine participants. They were asked what digital technologies they employ. I found it noteworthy that even though most of the interviewees used the same technologies, they had a variety of applications for the same technology.

Jeweller 1, applied Rhinoceros software to illustrate to clients what their commission jewellery will look like. CAD and CAM technology is also applied for the design and manufacture of some pieces if the complexity or budget requires it.

Jeweller 2 applies a variety of technology to render their expert services. For setting a microscope is used for increased accuracy. Jeweller 2 in their role as hand engravers, which is a fully manual application have found methods where technology eases the process. Design software is used to sketch and map out intricate designs onto pieces using a laser engraver. This process eliminates the process of mapping out a design by hand, which is time-consuming and not completely accurate. Jeweller 2 also applies the use of a pneumatic engraver. A pneumatic engraver functions the same way as a push engraver or stiggel. It applies air to drive the impact of the chisel, which means that less physical effort is required from the jeweller. To quote jeweller 2: "it's technology that makes my life easier, but it's not technology that does the job for me".



Jeweller 3 explained that they try to make everything themselves but use all the basic technologies available where it is the sensible thing to use. They make use of CAD and CAM, laser engraving and laser cutting where it is needed. All of these processes are outsourced.

The studio of jeweller 4 was completely void of modern digital technology. They only apply digital technology in the running of their website and online store. This jeweller works with hand skills only, as the preferred method of making.

Jeweller 5 believes that making jewellery with machines alludes to the magic that the hand and its imperfections bring from the piece. They have applied technology in the past, in the case where it made the product more affordable. They explained that some flat sheet pieces are less expensive to produce when laser cut, than piercing it by hand, which allows products to be sold at a more affordable rate. They have also applied casting technology, but the moulds were made from handmade pieces and not CAD or CAM produced.

Jeweller 6 is an expert laser engraver and laser welder. The business model is based on using these two technologies on any piece a client would bring in. Laser engraving is a process where the laser burns or dissolves the substrate away a little bit at a time in every pass. The outcome is dependent on pre-set settings applied to the design. A laser welder can be used to repair jewellery pieces with little to no heat transfer. Laser welding can serve as a soldering function as well as a reparative function for common casting problems like pitting.

Jeweller 7 built his business on the handmade effect. They explain that it is of utmost importance that they serve the client with a piece of wearable art made by them. In their experience of outsourcing and exploring other methods of production, they have made a conclusive decision of what is acceptable within their business parameters. The only technology-based processes employed by Jeweller 7 is CAD and CAM on the basis that they would do the hand drawings, sit in session with the CAD designer as they are not versed in CAD, then once the piece is printed and cast they would adapt the piece and add

that handmade feel to it. Laser engraving and micro-welding are two other technologies used by jeweller 7 when it is necessary for the best result.

Jeweller 8 employs both digital technology within the handmade practice. They apply CAD and CAM within the handmade process by using CAD to create the individual sections out of which a piece of jewellery exists, cleaning it up individually and then joining the pieces using either soldering or laser engraving. This means that the product is not cast as one piece but rather in individual sections, which mimics the handmade process.

Jeweller 9 is not bound to terminology as they stated that the term handmade is not all that important to them, but rather the quality of the individual piece. They employ all technologies available to them within the scope of what the piece requires. Jeweller 7 mentioned that making hand tools was important to their workshop as well as using a microscope for final touches. CAD and CAM are employed where necessary or requested by the client. Laser engraving on request of the client and laser welding where it is required.

#### ***4.1.4 Digital tools for the future***

The next question posed to the jewellers asked if there were any digital technologies on their wish list? These could include anything that could simplify the jeweller's process, aid them in any way to create a better quality product.

For jeweller 1 the wish list item to have would be a simple program to illustrate three-dimensional renderings of what a piece would look like for clients. Something faster than the commonly used Rhinoceros program and more accurate than hand drawings. Jeweller 2 explained that most tools for specialised setting and engraving are imported from either the United States or the United Kingdom, which makes it expensive and time-consuming to import. They explained that they make most of their tools themselves which streamlines the process of importing.

Jeweller 3 have not given it any thought and feel content that they have everything that they require from a tool and technology perspective. Jeweller 4 believes that even though every technology that exists is available to them, they choose not to apply it. It is a choice to work by hand with the basic jeweller's hand tools. Jeweller 7 also felt that they prefer making things by hand and that they don't have any technologies on their wish list.

Jeweller 5 had one possible wish list item that they would like to explore. They would like to use CAD and CAM to print stones. They would like to create handmade costume jewellery. Using technology to create the stones that are usually found in nature and bring that to the bench where the metalwork will be done by hand. Turning the process around. Jeweller 8 doesn't have any wish list items other than wanting to add a laser engraver to their workshop.

Jeweller 6 and 9 would like to explore two avenues of metal printing. Jeweller 6 explained that there are printers available that have the capabilities to print metal, but the finishes are not on a fine jewellery standard. Three-dimensional printing is an additive process that builds an object in successive layers until the object is complete. These individual layers leave a texture on the final product. This means that printing a piece in metal would still require sanding and polishing to create a smooth and shiny finish. Jeweller 9 would like to explore the possibility of 3D printing titanium rings. If the metal structure of the print is sound for jewellery purposes, that would make the process of titanium gents rings much easier. Titanium carving is difficult and labour intensive. With a rising trend in signet rings, titanium is a great alternative metal to precious metals, gold, silver and platinum. It is lighter and also a lot more affordable. Jeweller 9 also mentioned that they would like to explore how glow-in-the-dark metals are created. This is also a trend that seemingly arose overnight.

#### ***4.1.5 Jewellers process***

I asked each interviewee to describe their process from conceptualization to production. This question was included to gain a better understanding of the workshop practice of each individual. Their descriptions allowed me as the researcher to experience the process of

having a custom jewellery piece made by each of these jewellers. It was interesting to note how personal this process is for most of the jewellers. It is described as a journey.

Jeweller 1 gave insight into two processes, the first is the process they follow when designing a commission for a client and the second process would be developing a range for the shop. When designing a commission, the client would usually just ask them for an engagement ring, which does not give any stylistic preferences. Jeweller 1 would ask them to send some images of what they like, they would then make suggestions of designs incorporating some of these elements. The jeweller will supply hand-drawn designs at first. If CAD is required for the finished product, the designs will also be drawn up in CAD.

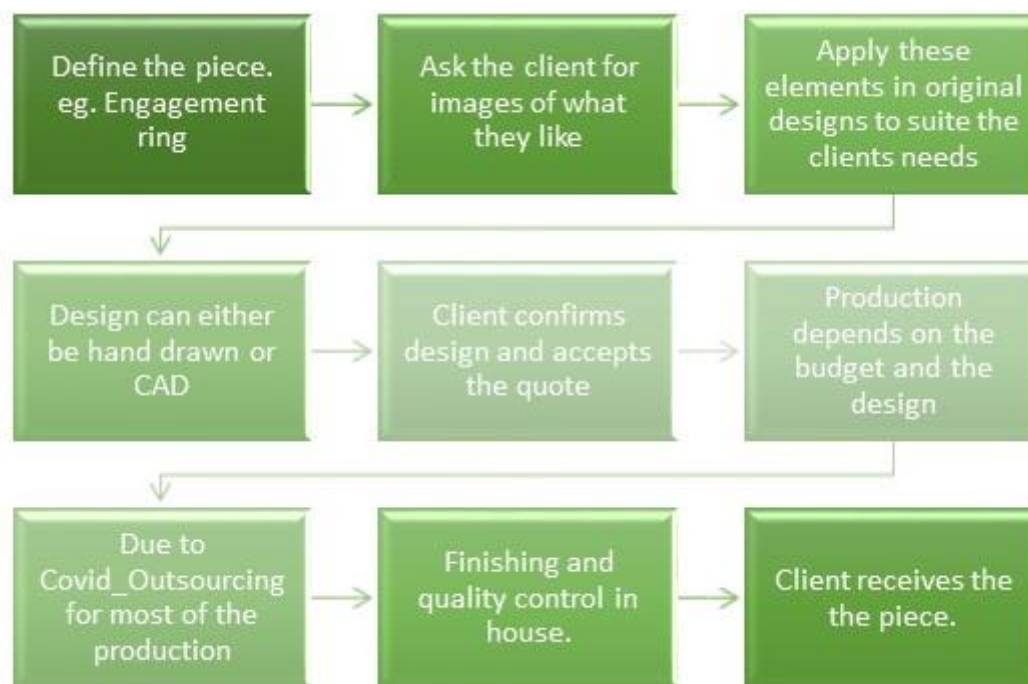


Figure 4.1 The process followed by jeweller 1 when designing a commission (Greeff, 2020)

Jeweller 1 states that most designs are built around the stones, whether that is the stone supplied by the client or one sourced specifically for them. Jeweller 1 describes jewellery as a personal item, and even when you know the client, you don't necessarily know what jewellery they like. It is important to gain as much knowledge as possible. From an approved sketch the next decision would be whether to produce the piece using CAD or if hand manufacturing will be the best option. The budget of the customer will also play a role in that

decision. CAD is accurate and cost-effective, so if that is the right choice for the individual piece, then it will be printed and cast. Finishing and setting are usually done by the caster, which means most of the process is outsourced. If hand manufacturing is the best choice, it will be done in their workshop. Due to the financial implications of Covid-19 and the lockdown, Jeweller 1 had to let go of most of their staff and had to rely on outsourcing more to complete work.

Jeweller 1 was also asked to describe how they would set out designing a range. Ranges in their case develop from designs done for commissions. If the design is something that they find beautiful it will be added to the range stock or otherwise developed into a range on its own. Jeweller 1 has been producing its signature range for about ten years and it is still successful, so designing something new with the addition of colour gemstones is the only consideration now.

Jeweller 3 describes their work as minimalistic. They draw inspiration and then distil it down into its simplest form without losing the nod to the original inspiration. Jeweller 3 states the process always starts by hand, whether the material is wax, play dough or silver, just to define the feeling of what it is going to be. The designs will then be produced either using CAD and casting or it would more often be made by hand in the studio. The process is decided based on the complexity of the design.

Jeweller 4 draws inspiration from all around. They explain that they try to isolate themselves from the trends in the industry to keep the work original. Jeweller 4 had spent some time working in the United Kingdom in the past, where it was quite common practice to copy a version of what someone else was doing. In their perspective that is the worst thing, you can do. For commission based work, they spend quite a bit of time getting to know the client and understanding what the client would like to gain or capture with the piece. They go on a journey with the client creating an original piece. Jeweller 4 highlighted the fact that they instruct possible clients to look at their past work first, to ensure that the style of work is what they truly want.

When jeweller 4 designs range pieces for their online store the process is seemingly organic. They describe that ideas usually come to them while not being able to sleep. Currently, they

are reading a lot of children's books as the children are home during the lockdown which contributes to the creative process. They describe drawing inspiration from their immediate surroundings and their interests. Whenever they see something they find beautiful they would keep it in mind to possibly use it somewhere in the future. Jeweller 4 described an example where she noticed a piece of costume jewellery in a store and liked the concept of having a split earring. In that case, it was a leopard earring with the head in front of the earlobe and the body at the back. They explain how they walked around with that idea for nearly ten years and eventually incorporated it in a necklace for a commission. At the end that was not what the client had in mind, so the design was put on hold again and eventually was used for a different client altogether. The process jeweller 4 describes is organic. Designs grow and develop from their daily life and the trials and tribulations of their clients.

Jeweller 5 describes how her ideas grow and evolve from her sketchbooks. These books are idea journals for saving and developing ideas. Jeweller 5 describes her process of designing earrings in great detail. My interpretation of her process is that it is organic and one step develops from the previous. The starting point is the stone. They select stones that are visually pleasing to them, sourcing usually happens without a clear vision of the end product at first. With the exception, they would pre-sketch and have stones cut or sourced specifically, but mostly the process occurs through play. They describe sorting stones on a table and moving them around to see what develops. From there the sketches will be drawn up like the examples in the figure below. The design process continues to evolve during the manufacturing for Jeweller 5. They describe working with mistakes and trying to fix errors in the manufacturing process could produce magic. According to Jeweller 5: "It's not just accepting it as a mistake, this maybe was not intended, but then not being so set in your ways and the plan to be open."

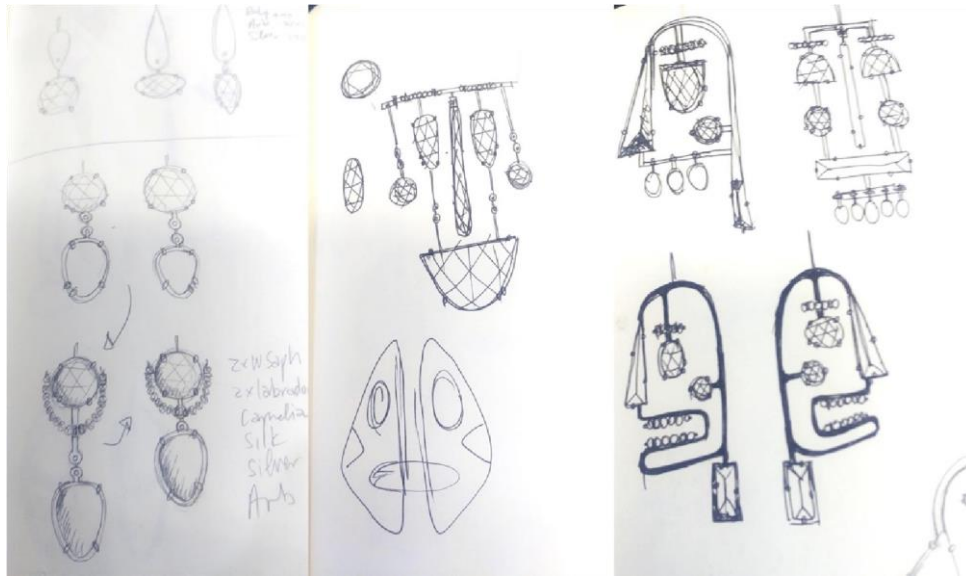


Figure 4.2 Sketchbook samples provided by jeweller 5 (Adapted by Greeff, 2020)

Jeweller 7 discussed how his process and connection to the customer is his artistry. It is what makes the work unique, not the piece itself but rather the journey that was set out to create it. Jeweller 7 described the process of designing their current range as a continuation of the previous range. They enjoy writing stories for their pieces then viewing the transformation of material and the imbuing of something as described in the story. It is about the emotional connection to the piece for both the maker and the wearer. They describe how they attempt to capture the story or memory for the client in the piece. Jeweller 7 describes their current process as “the journey is really about putting myself into every piece and keeping it open as a vessel, for someone else to print themselves onto it”. They further describe themselves as made brutal: “that’s my internal self, putting myself onto it like I’m kind of a darker soul but not in a destructive way”. They discuss the achievement of that raw emotional application to their work through techniques like boiling metal to create bubbles, hammer textures, filling and sanding marks left bare to illustrate the rawness and transfer it to the person wearing the piece.



*Figure 4.3 Examples of the texture found in the work of Jeweller 7 (Provided by jeweller 7)*

Jeweller 8 explained that they focus on designing commissioned pieces of jewellery as that is the market that provides the best financial gains at the moment. They discuss that the process starts with requesting photographs and videos of what they like in advance of their face to face meeting. They design a few options for the client using the inspiration provided and adding their unique twist. They discuss that like any other designer they do not like copying other designers work, but some clients simply want what they have seen. They explain that you cannot always show work away and that these pieces will not be advertised. Jeweller 8 presents the client with a drawing done with a combination of Rhinoceros and Photoshop to add some colour.

Even though Jeweller 8 is not a CAD designer he finds this process more efficient than drawing by hand. With the sketches, traditionally they also present pricing options to the client. The client makes their selection and from there the manufacturing method is chosen based on what best suits the design. Jeweller 8 explains that tools are there for you to use to improve your product, it is your responsibility to give the client the best quality product possible with the tools at your disposal. Jeweller 8 discussed how they use Rhinoceros to determine angles instead of paper and protractor, which is not always accurate. Technology if used correctly can improve the quality of your product.





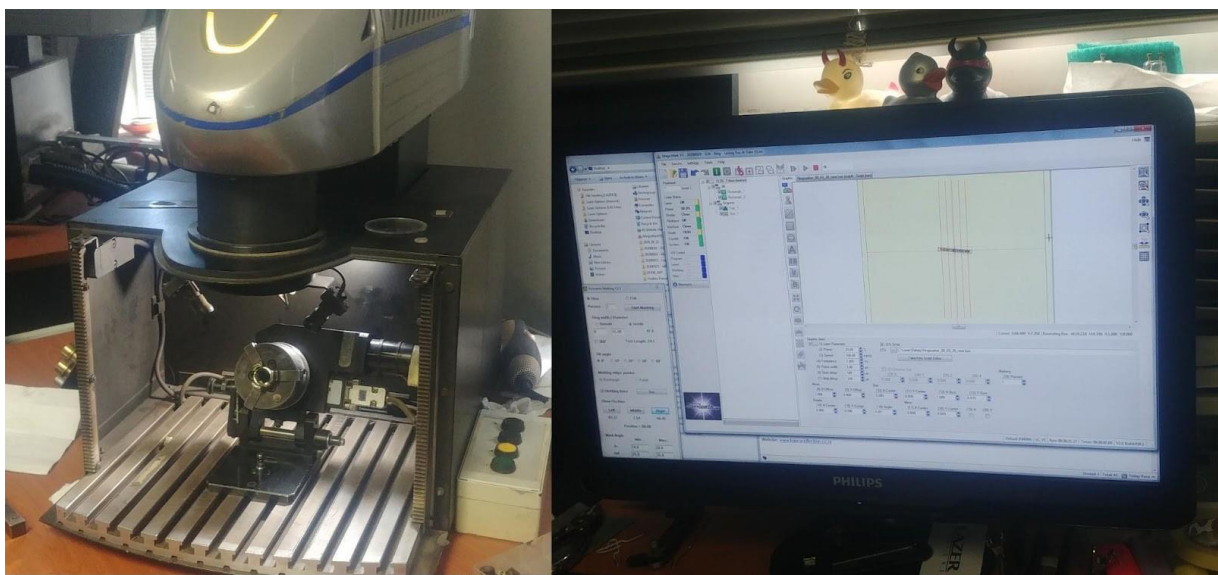
*Figure 4.4 The process followed by jeweller 8 when designing a commission (Greeff, 2020)*

Jeweller 9 has a similar process to Jeweller 8. They start with the client pointing out what they like. They keep about five to ten photographs that illustrate the client's style. For Jeweller 9 it is important to remove their style for the product and focus on what the clients want. They spend time identifying what shapes and angles the client likes and which elements they do not like. Their designs are created using the elements the client pointed out. They work with orthographic drawings to build basic concepts that create balance. Balance is an important component for Jeweller 9. They will send the client no more than three options to avoid confusion. The client will select or make another change or two until one design is finalised. Some clients struggle to see the design in three dimensions, for them they would have the design drawn up in CAD. When a design is drawn up in CAD they explain to the client that the design has to be cast. If a design is for the bench they would write out a brief with strict instructions of how the piece should be built. Jeweller 9 has a very structured way of running her studio. Jeweller 9 established that the ability to remove their style for the equation allows them to truly create what the client wants, through a journey of getting to know the client.

Jeweller 2 and 6 are both service providers to the studio jewellers, so they do not have their process to discuss. Their focus is on the expert service they provide to the industry.

Jeweller 2 is a trained setter and provides this service to the industry. Most jewellers can set basic settings, whereas Jeweller 2 have experience setting in South Africa for studio jewellers as well as high-end fine jewellery. They have also worked in a high-end mass production workshop in Canada. Jeweller 2 has the experience and expertise to set complex settings and work with fragile high-value stones. Jeweller 2 makes use of a microscope to ensure that all settings are neat and finished off to perfection.

Jeweller 6 gave an overview of how the laser engraver works explaining that it is computer controlled which allows for any design thinkable to be drawn on CAD and laser engraved onto the piece. Text is built into basic programming, but any line configuration can be applied. As to how it physically engraves they explained that the laser engraves or vaporizes little lines all over the design. The amount of passes it will complete over the design is determined by the depth setting which is controlled manually. They explained that one pass will have a very slight texture and with every passing texture the design would be imprinted deeper into the metal. A pilot light from the laser needs to be manually lined up with the design. The process leaves a lot of room for error, as every piece is different, which will change how it is set up and at what setting configuration it will be engraved.



*Figure 4.5 Laser engraving machine with desktop computer set-up (Photographed by Greeff, 2020)*

Jeweller 6 noted that a popular practical use for the laser engraver is to engrave the metal label, instead of manually stamping it. On small pieces, the standard stamp indicating the metal quality and alloy, which is required, could be bulky and even damage a fine piece. Engraving it ensures that the scale can be adapted to suit the piece with minimal distraction and no damage. As to the shortcomings of the laser engraver, Jeweller 6 noted that the bright cut which is synonymous with traditional stigel or push engraving cannot be achieved. As the laser vaporizes the metal one layer at a time it leaves a dull textured surface, whereas the stigel cuts into the metal with a sharp blade leaving a high polish in the cut.

Jeweller 2 can provide the service and effect that the laser cannot. Traditional engraving methods even when applied using a pneumatic engraver leaves the piece with a signature bright cut. The figures below illustrate the difference between laser engraving and traditional engraving.



*Figure 4.6 Illustration of the stylistic differences between hand engraving and laser engraving provided by Jeweller 2.*

#### ***4.1.6 To what extent can digital technology be incorporated within the handmade process.***

It was interesting to note that the opinions were not concrete and that they varied from no digital application in the process at all to some jewellers saying that a mixture of processes will allow for the handmade title to stand in place. The authenticity of feel is also a comment made by some, meaning that if the piece attains the feeling of being handmade, irrespective of process, it is still handmade.

Jeweller 1 believed that including CAD into your practice is the maximum extent of technology that can be included in the manufacture of handmade jewellery. They elaborate that this is conditional to no pre-set stones in the wax to cast. They believe that it is important for someone to still do the setting by hand and that the finishing process is also done by hand. They explained that attention to detail in the CAD is of utmost importance and that the person doing the quality control of the finished product should be experienced.

Jeweller 2 is both a traditional setter and engraver and in the same sense not so traditional as they apply technology in their practice to achieve a better quality finished product whether it was made by hand or with digital technology. Jeweller 2 explained that the tools used do not replace the person doing the work, but rather makes the work a little easier. They gave an example where a pneumatic engraver simply makes engraving less strenuous for a person doing it, but the same skill is needed as the engraving is done with traditional stigel. Jeweller 2 believes that there is a gap in marrying old techniques with new technology to determine the most cost-effective and efficient way of creating authentic handmade jewellery. They note that both digital production and hand manufacturing has both pro's and con's, but if you have the skill and knowledge of both you could marry those two together to achieve a better product.

Jeweller 3 explained that there is no hard and fast rule of the line for them and that in their opinion the line is different for everyone. For them, it is all about the feel of the piece. Does the piece still feel handmade and does the maker's mark still show what is important to them? They explained that in their opinion you can't quantify the percentage of how much of the process should be handmade and how much can include technology. They believe there is no line there, but rather the feeling the piece evokes for the wearer and whether they can connect to the piece and the maker or designer. To quote jeweller 3 "whether it was designed on an interface, a human was still involved." Something produced with technology is no better or worse than something made at the bench using a hammer. Jeweller 3 elaborated that in their opinion that the hierarchy of handmade is better or is always better, is a very problematic statement and one should start to interrogate. "Nothing is just handmade or nothing is just machine-made. Everything is a complex mix of different things and I think if we can embrace that complexity, we can do some creative and exciting things."

Jeweller 4 had a completely different opinion in that they believe that it is not possible to include digital technology in the design and manufacture of handmade items. Jeweller 4 believes that it can only be authentic handmade when produced solely at the bench using

traditional techniques and methods. Even though Jeweller 4 is of the firm belief that digital processes cannot be used to create handmade jewellery, they also stated that the knowledge required to design and work with the digital formats are the same as the person creating by hand.

Jeweller 5 explained her opinion with an example. They felt that a combination of technology and traditional manufacturing could ensure the authenticity of a handmade product. They explained that if you sit and sculpt a piece digitally for hours and that piece is cast from the digital file that still leaves the finishing and setting to be done by hand. Which in their opinion translates to the machine not being able to replace the knowledge of the maker and that the maker would still need to set and finish the product. Jeweller 5 had mixed opinions of when the term handmade can be used. They explained that the signet ring they are wearing was cast and not handmade, yet casting is a process that is done by hand, which left them questioning when it can be called handmade. The digital sculptor is using the mouse and the manual wax tools. They remained unsure whether it could be called handmade or not if digital tools were applied, to them there is something special about taking the metal pebbles and through a series of manual processes turning them into a piece of jewellery.

Jeweller 6 used the example of three-dimensional printing to explain their answer. They concluded that they are of split opinion because the piece printed would be cast and finished by hand which makes those parts part of the process manual, but it was not concrete according to them. They explained that the signet ring on the bench was handmade. The master was created by hand and mould-made, to cast multiples and they were all hand finished and now a laser is used to inscribe the design on all of them. So in their opinion, each major part of the process was done manually, and finishing touches were done with a laser. When asked whether they consider the process of laser engraving as a digital or manual process they exclaimed that 98% of the process involves a human.

Jeweller 7 explained that they are not averse to technology, but they would only use it as scaffolding in the process of creating a piece. They believe that if you work on the piece that was printed and cast and apply various manual processes over that digitally created scaffolding, they would still consider it handmade. They reiterated that they enjoy the process of taking raw material and smelting it, rolling it and beating it into shape, and then finishing it to a high shine or oxidising it or bringing in another raw material like a stone. They

also stated that they don't make their stones and that technology is involved with the cutting of the stones. So for them, the line is not too fine, as long as they have applied multiple processes and put in enough hours they will still consider it handmade. It just can't be a digital file printed and cast; and only finished by hand, which will not be considered handmade in their opinion.

Jeweller 8 embraces all technologies and processes available to them and does not restrict themselves to the confinements of one or the other. To them, the process is determined by the individual design and what is logical the best route to follow to create the best quality product. Jeweller 8 has an open-minded approach towards technology and progress, to them the fundamental goal is to create the best possible product for the client irrespective of whether it is handmade or digitally produced.

Jeweller 9 believes that the authenticity would lie within how you compartmentalise your process. Using technology in casting in areas where perfection is required like in the making of settings, but then manufacturing the shank and other compartments by hand will give you the authenticity of a handmade piece. Making a piece in sections allows for better finishing in otherwise hard to reach areas. Another factor to consider is the metal thickness when applying digital technology. Metal thickness must be increased to counteract the shrinkage in casting and metal needed to clean up and finish a product to the highest standard. If done with technical expertise the use of digital technology can be beneficial to the final product.

Even though the opinions were conflicting and no consensus was achieved on the subject, it is interesting to note that the important aspect for the jewellers, in general, remains the importance of a good quality jewellery piece in the end.

#### ***4.1.7 Additional information provided by the interviewees***

The conversational style of the interviews led to participants supplying information that was not necessarily asked. The following topics emerged during the interviews.



#### ***4.1.7.1 Gold licence in South Africa***

I found it interesting that two of the interviewees noted that the issues with gold licenses in South Africa cause unnecessary problems. Jeweller 1 explained that the gold license system used in South Africa is pointless and creates unnecessary administration for studio jewellers. The application process is tedious and you are never sure if you are doing it correctly. Jeweller 4 also commented on the red tape surrounding gold licenses. Is this sort of controlling body necessary or if it is, is it effective in its current format? That is the question that comes to mind.

#### ***4.1.7.2 Outsourcing of manufacturing***

While most of the jewellers interviewed make use of outsourcing of some form in their design and manufacturing process, some do so more than others. Jeweller 1 discussed that due to Covid-19 they had to retrench most of their staff and are now outsourcing most of the manufacturing. Their outsourcing includes CAD design work, 3D printing, casting and some traditional manufacturing as well as setting and engraving. Due to the economic climate post-Covid-19 lockdown, this made sense for the company. Under normal circumstances, they would only outsource CAD design work and some specialist setting and engraving work.

Jeweller 2 explained that you can be successful as a studio jeweller and not be a goldsmith at all. They explain that without being the best at the bench you can be successful if you are very skilful at design. He explains that a studio jeweller doesn't need to be the best at everything, you can simply be the best at outsourcing. For specialised processes like setting it makes sense to outsource both from a financial point of view as well as from a quality standpoint.

Jeweller 3 likes to keep everything in house. They do outsource CAD designs when necessary as well as setting. They explain that they have a very pragmatic approach, where they try to keep everything in house to insure quality but where a specific skill is required they would outsource. They believe in a company culture where you would want to create.

No one has simply one job, but rather does a bit everything from cleaning the floors to design and manufacture.

Jeweller 4 was steadfast in the fact that they don't outsource any part of the process. If they can't provide the service in-house they simply would not take the commission. Outsourcing services are usually located within the city and are situated in suburbs which also deters from making use of those services. Jeweller 4 even produces its packaging in house. To them, it is about having complete control over the process and the final product is true to their aesthetic.

Jeweller 5 believes that one needs to play to their strength, and for someone who doesn't enjoy working with strict measurements, they tend to outsource pieces that fall in the fine jewellery area.

#### ***4.1.7.3 Training of studio Jewellers***

The subject of training came up in conversation with a few of the jewellers, each sharing their point of view of what they think should be done or how training should be approached. Jeweller 2 in particular had a few considerations to contribute. Jeweller 2 feels there is a lack of knowledge being passed down because of the loss of the old school apprenticeship. University provides a good overall base of knowledge but it does focus on any speciality. Jeweller 2 believes training should be more specialized in future yet in the same sense with the current economic climate for studio jewellers to survive they would need to diversify.

Jeweller 2 also explained that it is still necessary to learn all the traditional skills to apply the technology with expertise. A good understanding of the setting will aid the CAD designer in rendering a product with technical accuracy and maximizing the use of technology.

Jeweller 3 has an important voice from a socio-environmental level. They believe that handmade creates opportunities and employment where mass mechanisation doesn't but also agrees that we can no longer resist mass mechanisation, but rather find new ways to create employment. Jeweller 3 believes that the recycling of high tech products to reclaim



precious metal is a way to counteract the employment loss of mass mechanisation. The use of reclaimed metal is also better for the environment. They explain that especially in South Africa where a fast section of the population doesn't have the technical know-how or skills to work with digital technology we should also consider expanding jobs at a variety of skill levels. In their opinion, the recycling of e-waste is a low tech manual process that can fill some of that employment gap.

#### ***4.1.7.4 The impact of Covid-19***

Jeweller 1 was impacted quite heavily in that they had to retrench most of their staff due to the extended lockdown preventing them from doing business as usual. The second factor was the steep increase in the metal prices and the fluctuating dollar price which made it very difficult to price items accurately and also very expensive to produce.

Jeweller 2 explained that even though they had a difficult month or two, the diversity of being a service provider as well as designing and manufacturing their range kept business going. Jeweller 2 also explained that the studio jewellers that we're able to work from their home studios were producing work throughout, whereas bigger customers that were confirmed to large workshops could not continue during the hard lockdown.

Jeweller 3 explained that the Covid-19 pandemic taught them to never say never. They closed their shop during the lockdown and moved to an online space completely. They concluded that not having a shop frees up time for design and manufacturing, while still amounting to sales.

Jeweller 4 commented that because they work from a home-based studio, the lockdown did not affect them too much. With their online platforms still active and being able to produce from allows for business to continue. They explained that they view the studio jewellers ability to adapt and change their way of working as a foundation taught in design education. Resilience to overcome adversity with creativity is the fundamental characteristic of a studio jeweller.

#### ***4.1.7.5 Patented design rights***

Design patents in the jewellery industry have always been an area of conflict. Jeweller 8 explained that sometimes you just have to give the customer what they want, but where there is the line of integrity and intellectual property with the advance in technology it is easier to copy designs than ever before. Jeweller 8 explained that they strongly opposed producing a copy of another design, especially a well-known patented design, yet financially it is not possible to show away business. In their opinion, it is best to try and convince the client to make some changes and if that fails simply don't advertise that item as part of your repertoire.

#### ***4.1.7.6 Jewellers community***

Jeweller 1 referred to the need for some sort of collective for jewellers to make it easier to source materials and stones as well as service providers. There is a need to structure it so that pricing is centralised. Jeweller 9 also stated that the industry is detached in the sense that pricing is not always controlled. Even though the diamond price is regulated and the gold price determined globally there are still major discrepancies in prices.

#### **4.1.8 Key findings from the contextual inquiry**

The contextual inquiry reiterated the importance of handmade to the studio jeweller. The majority of jewellers noted that the handmade label is important to the consumer and to the design process of the designer. The consumer still attaches a perceived higher value to the handmade jewellery piece than to the mechanically produced.

Digital tools in current practice are varied in their application but are applied to some degree by most of the jewellers interviewed. One jeweller expressed that they shun the use of digital technology completely and the only digital application in their practice is their website and online store. No part of the design process of manufacturing applied any digital tools.

Digital tools applied by the jewellers are:

- i. CAD software like Rhinoceros, Matrix, Vray, JewelCad, Zbrush and Brazil
- ii. CAM tools refer to 3D printing in wax and resin for casting, model printing in PLU plastic and resin.
- iii. Laser tools for manufacturing applications are laser welding and micro-welding, laser engraving is a digital surface application tool that is applied in conjunction with CAD software.
- iv. No Artificial intelligence applications were discussed.
- v. Direct metal printing was mentioned as something worth investigating, but not yet applied in practice.
- vi. Three-dimensional scanners were noted as a possibly useful tool in the replication of sentimental antiques and some design request like the engraving of a fingerprint or any other very specific parameter design.

The thematic analysis of the contextual inquiry revealed that the jewellers who are reluctant to apply digital design techniques are not familiar with possibilities in their application. It was also noted that many designers who actively apply digital tools within their practice, does so utilizing outsourcing due to lack of training and expertise in these tools.

## **4.2 Co-create workshop**

The second iterative cycle of research was conducted in the form of a co-create workshop. The workshop was conducted based on the findings from the literature review and the first cycle of research, the contextual inquiry. The data provided by the contextual inquiry and the literature review were analysed and organised within the context of the theoretical design process developed by Batista (2012) as illustrated below. The theoretical design process is a method for the designer to work systematically. The data was compiled to illustrate how they relate to each stage of the design process and which tools could be applied.

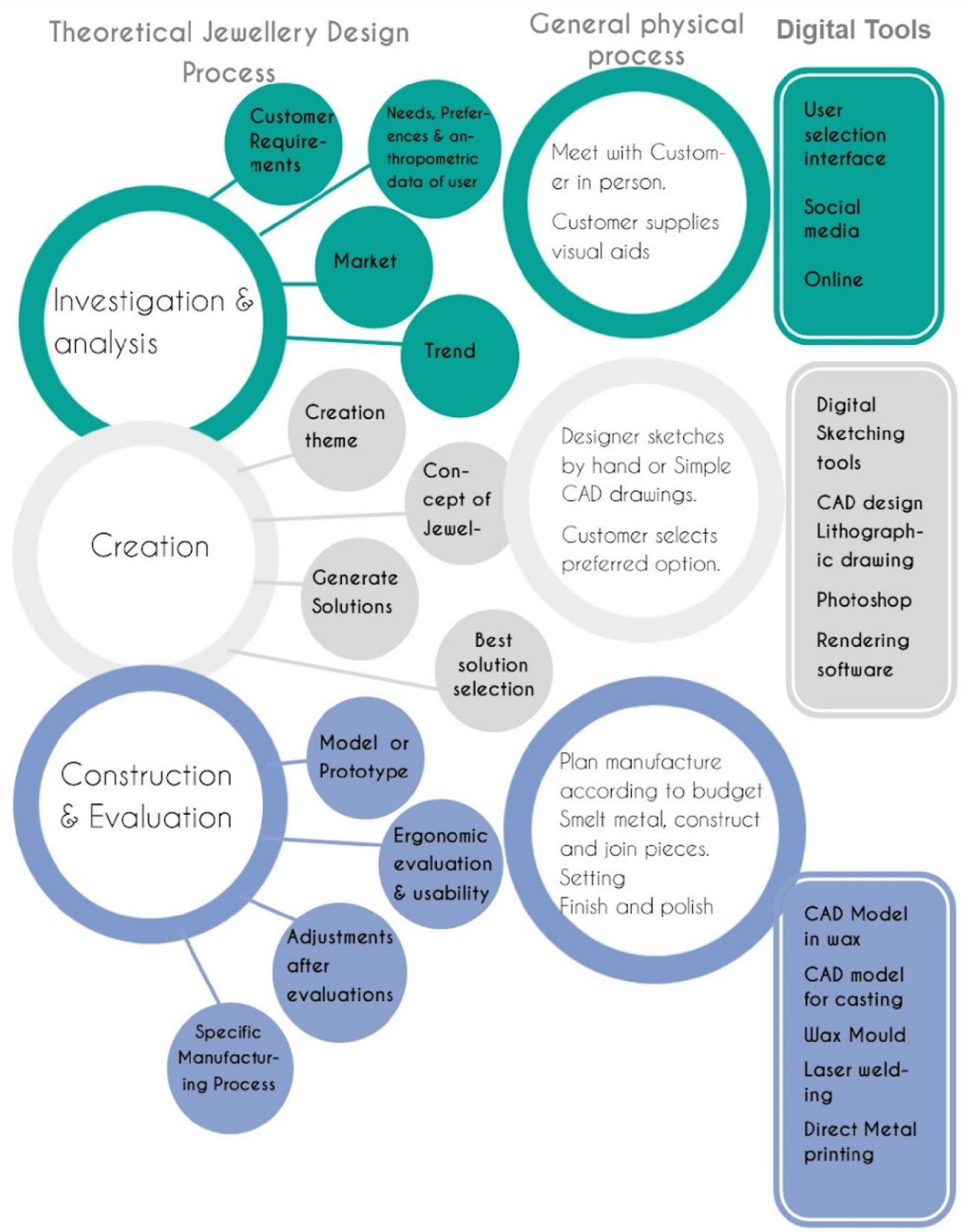


Figure 4.7 Illustrated findings from the first cycle of research. (Greeff, 2021)

The rapid development of technology could impact the future sustainability of the studio jeweller in their ability to remain viable in terms of price, time, material consumption, variety and complexity of design afforded by digital processes. The importance of handmade and the preservation of high-quality handmade jewellery for the future is essential for the studio jeweller.

Participants were invited to take part in a co-create workshop where they would aim to create a new design process appropriate for the post cyber designer. The participants consisted of two newly graduated jewellers and two studio jewellers who have been in the industry for more than 5 years. I the researcher facilitated the workshop alongside my Supervisor.

The workshop aimed to create and develop a process or a framework that is appropriate for the future post cyber studio jeweller to mitigate the complexities of incorporating digital design technology into the traditional process associated with the handmade jewellery piece. The new process will produce jewellery that is considered handmade, designomic in costing (Hashim, 2018), has freedom in design, upholds the highest quality and intrinsic value.

The participants were provided with a background of the study and what the aims of the workshop were. Working with the three stages of the design process established by Batista (2012) the participants and facilitators set out to restructure the tools that could be applied within each stage. Each tool from the list was discussed and considered for its relevance to the studio jewellers practice. The figure below is a summary of the findings made during the co-create workshop.

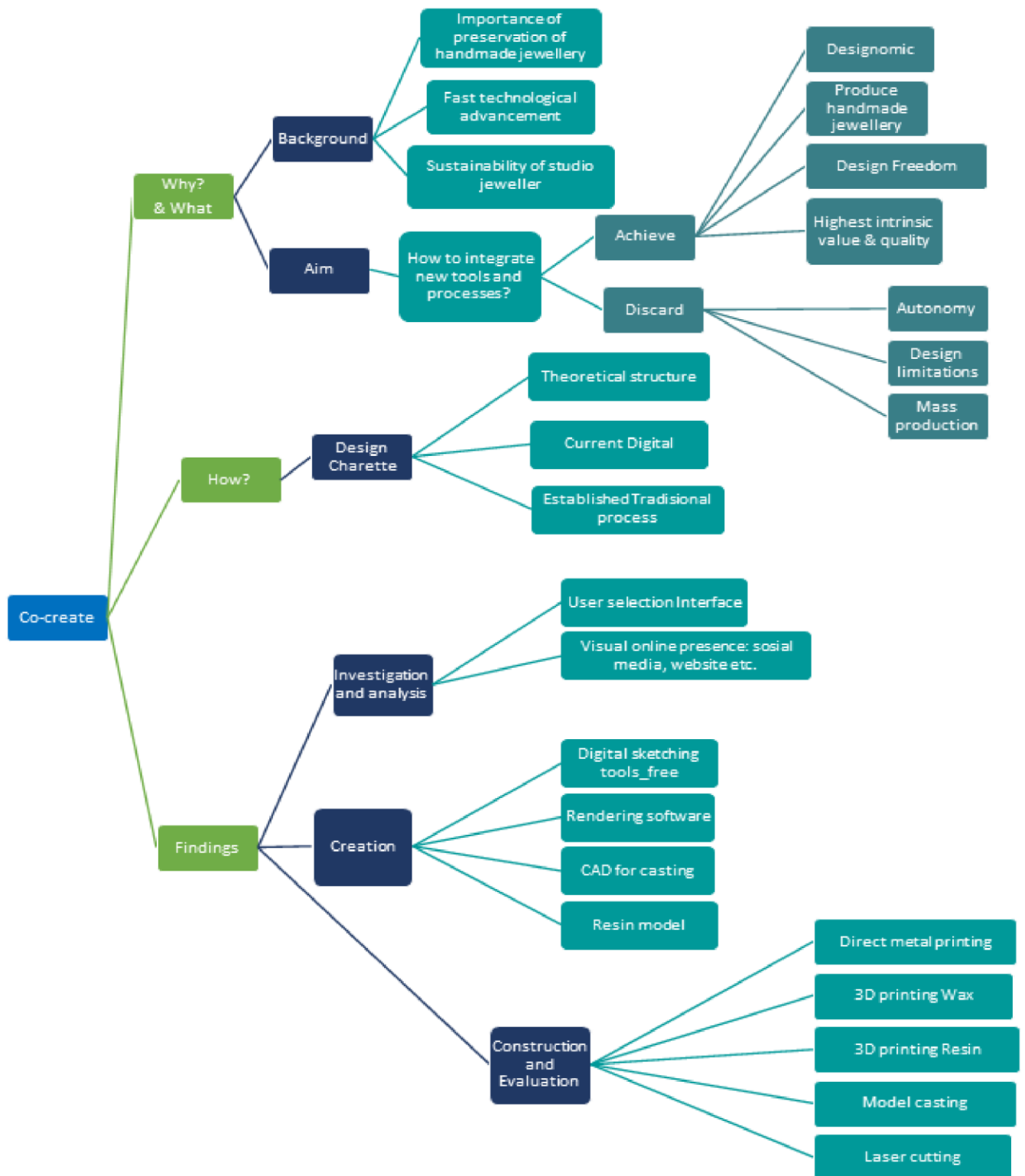


Figure 4.8 Summary of the findings of the co-create workshop (Greeff, 2021)

### ***4.2.1 Investigation and analysis***

Batista (2012) explains that the first stage of the design process is where the designer investigates and gathers the data required for the project. The designer must identify customer requirements; the needs and preferences of the user, as well as the anthropometric data required to make the piece. The group discussed a User selection interface as a tool to apply during this first stage. A user selection interface would be a simple application that would allow the user to select a stone type and size, then a setting type to hold the stone and then lastly a shank for the ring. This would be a limited selection, but it allows the consumer to consider their options before initiating a meeting with the designer. The concept of such an application would be aimed at an economical to the moderate budget consumer. The choice range is limited, but the consumer would be able to view a design and get the estimated price before a face to face meeting. An application like this would not be as functional with high-end consumers. If the consumer requires something unique the most practical way to conduct that consultation was still found to be in person.

This application allows the designer to capture data from the consumer before the meeting. The consumer understands visually what they would like and the designer gains a meaningful explanation of what the consumer requires. This type of application was however not recommended for production. The participants agreed that the application should only be applied to create a visual representation of a design. The design should still be sculpted in computer-aided design software manually and then cast or made by hand.

The concept of economic segregation was discussed. It was established that the user selection interface would work well for lower economical consumers as it is non-committal and allows the consumer to view their limitations in price. This will ensure the client has realistic expectations during the face to face meeting with the designer. With this knowledge before the meeting, the designer can present appropriate designs and stones to fit the consumer's budget.

To establish a brief with the client, the participants noted that an email, user selection interface, zoom meeting and in-person meeting are all relevant. Each method plays a role in building a relationship with the consumer and gathering vital information that would make a design successful. The complexity of the client news will determine how many of the above methods would be employed.



The visual online presence of the studio jeweller was identified as important. This guides the suitable designer to the target client. Participant 4 explained that if you have a curated online presence the consumers that do contact you would already be interested in something that suits your aesthetic and would not request something that is not suited to your business. Your online presence should not contain any visuals that are not brand appropriate. The consumer's visual research, before contacting you as a designer should lead them to your online presence, whether that be your website, social media or conventional marketing like magazine features.

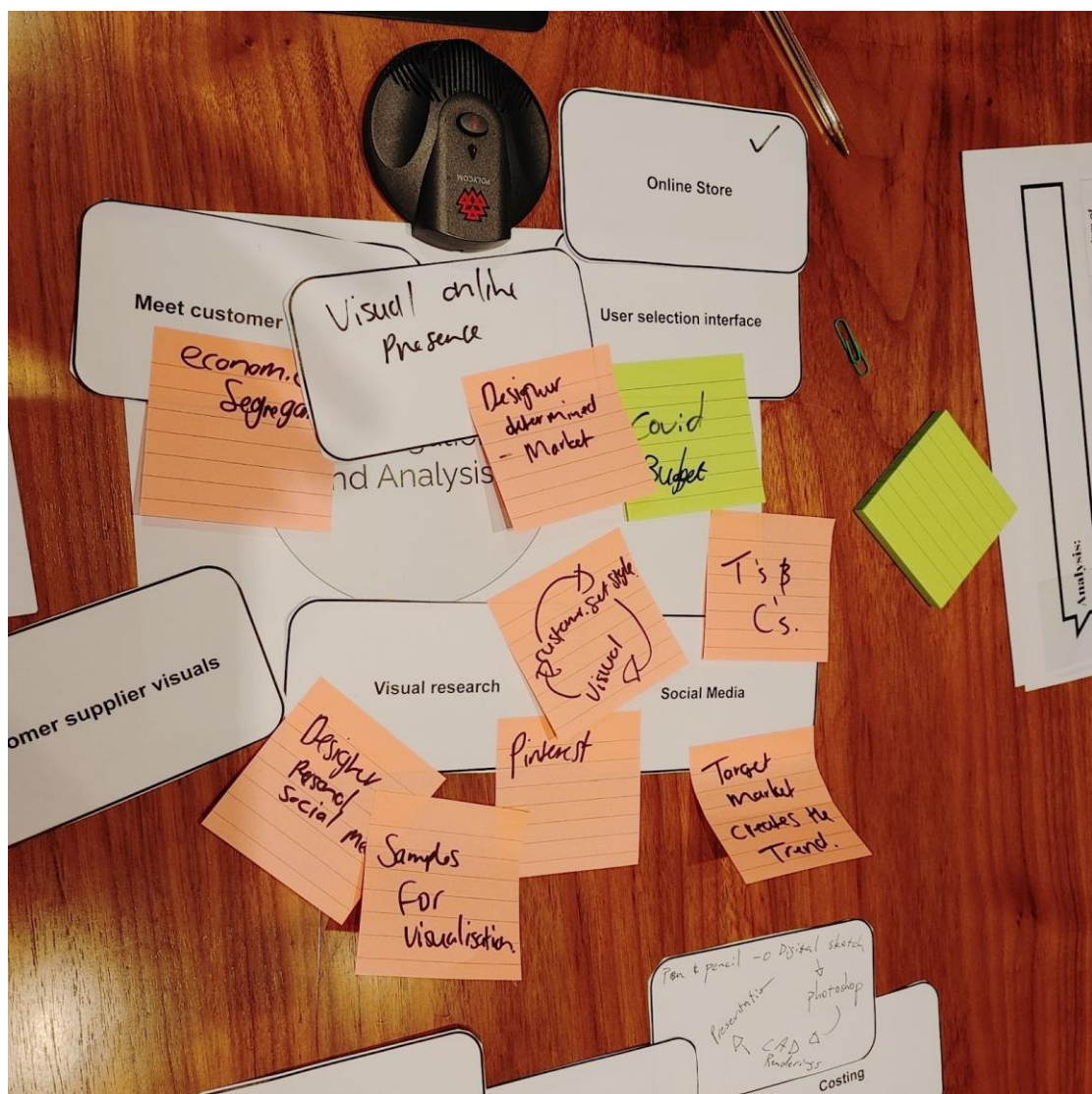


Figure 4.9 Investigation and analysis discussion during the Co-create workshop (Photographed by Greeff, 2021).



The figure illustrates the tools and concepts discussed during the investigation and analysis phases where mapped. The designer determines his or her target market through the design aesthetic. The visual presence will determine the consumer and market in which the designer works.

#### 4.2.2 Creation

The second stage of the Batista (2012) model is the creation stage. This stage includes the creation of a theme, the concept of jewellery and the generation of design solutions. The participants explored tools and methods that could be applied within this stage.

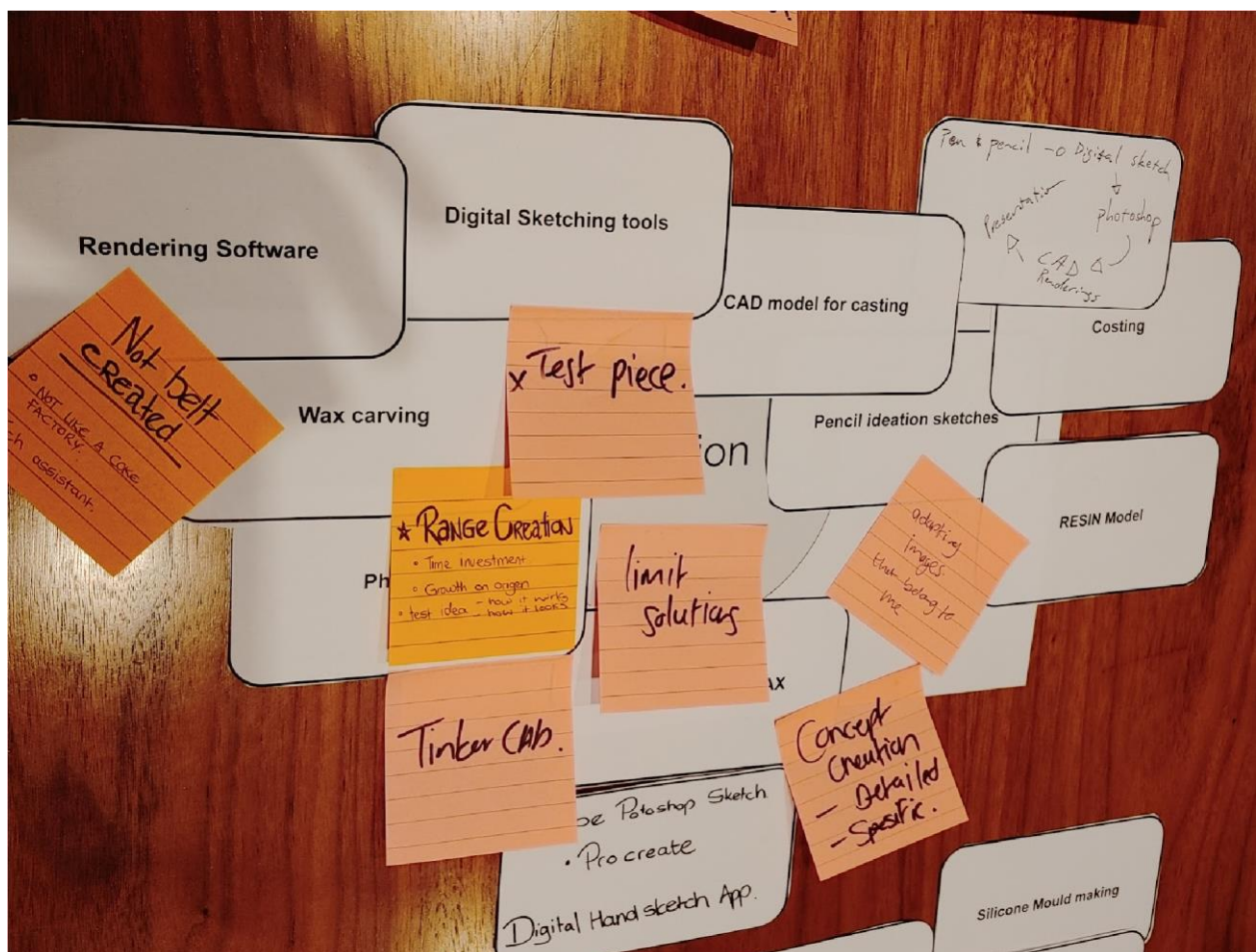


Figure 4.10 Creation discussion during the Co-create workshop (Photographed by Greeff, 2021).

The creation of the conceptual jewellery piece can be done using many digital tools. Tools found most efficient are free digital sketching tools that are easy to learn. Simple rendering software for presenting designs with a more realistic approach. These two-dimensional tools

are effective for presenting designs at a faster pace than with hand drawings. Even though there are many tools available, participants agreed that initial planning still happens by hand.

Participant 4 explained that in most cases their visual references sourced mostly from their previous work or examples of sample designs will be the foundation of a new design, and the sketching would happen with pen and paper with the consumer before being sent to the CAD designer for the final drawing. If a design does not require printing or casting, the design processes will remain in pen and paper format. Participant 3 prefers to do sketching on Rhinoceros software and Photoshop. Participant 1 applies a hybridised process of sketching on a tablet and then applies Photoshop or Rhinoceros for added detail. Participant 1 explained that if we were to put that into a process the steps would be as follows:

1. Sketch on paper
2. Import into the digital sketch to add detail
3. Import into Photoshop to add colour
4. Import into the CAD program of your choice to draw a Model and present it to the consumer.

The participants discussed how many options or design solutions should be presented to the consumer. Participant 4 explained that they only present one key concept or solution after consultation. The consumer would receive a detailed digital sketch and would be allowed to change. If more than two changes are required or a completely new design or concept needs to be developed the consumer would be billed for the time and design created. For participant 4 the conceptualisation and consultation with the consumer are vital for the success of the design process later.

The design creation process can also be done in three-dimensional models. The digital process the participants felt to be most viable is CAD printed models in both wax and resin. These could be applied as a visual representation of a sketch or they can serve as the scaffolding for the production process. Participant 1 explained that a simple wax or resin print of a design will give the consumer a realistic perspective of what the final product would be. The cost of this process could easily be incorporated into the cost of the final product. Participant 4 said that it is important to keep metal samples on hand as well. They added that when they create range pieces they would often create a single design to test the market with or to show to their social media following. That piece will go through all the phases of investigation and conceptualisation, creation and manufacturing. If there is interest a range would be developed from that, but that piece would remain a sample piece to show consumers. Participant 3 explained that they would build a complex design in play dough first. That provides a chance to conceptualise in 3D without the commitment of metal.

This method is not always realistic when creating a custom design, but could work well when developing a range.

Participant 4 noted that when you are developing a range, you will invest more time in the conceptualization stage than you would in a custom piece. Participant 1 reiterated that more time is invested into range pieces as they are intended for a larger audience and a custom piece only attends to the needs of one consumer.

#### 4.2.3 Construction and Evaluation

During the last cycle of the process, the production of the piece takes place. Participants consider a variety of tools and processes that could be included in the handmade process for the post cyber designer. The overarching sentiment was that any process could be included if it is applied as a tool and a complete production process.

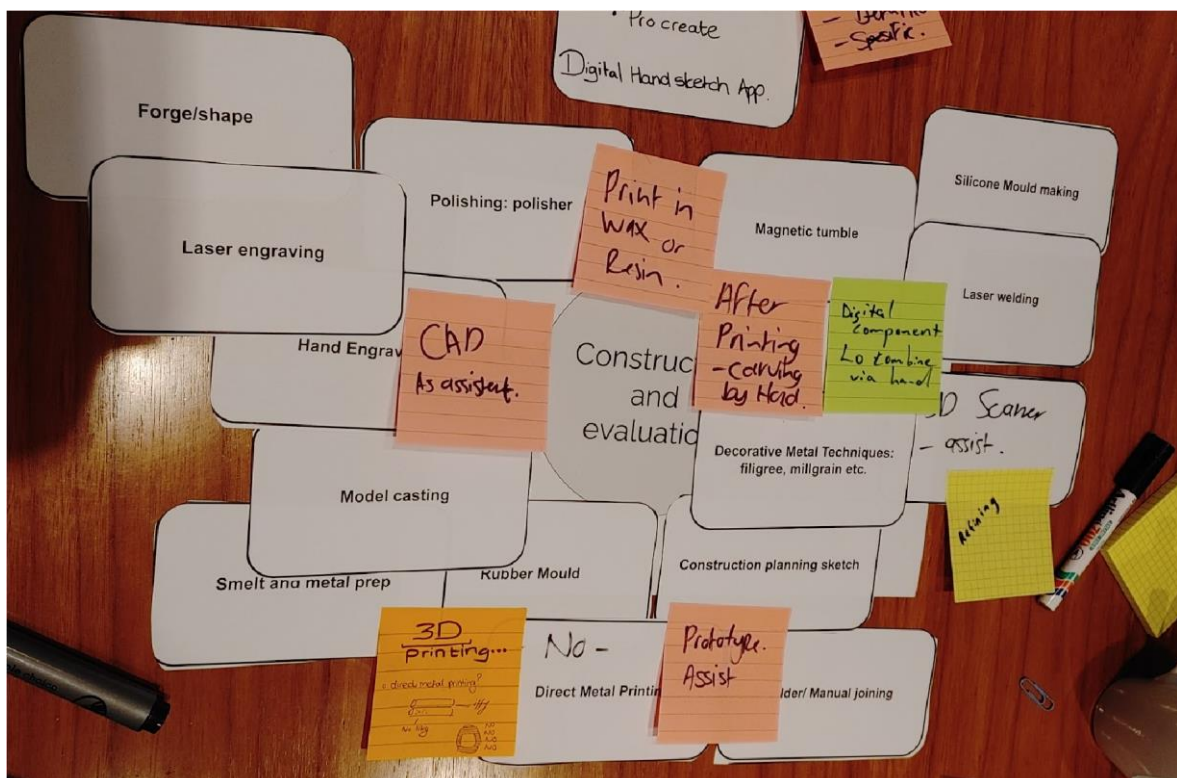


Figure 4.11 Construction and evaluation discussion during the Co-create workshop (Photographed by Greeff, 2021).

Participants considered what methods would enable them to still call a piece handmade. Participant 4 explained that they prefer the term handcrafted as a blanket term. In their practice, they continuously add handwork to pieces throughout the process. They explained that in most cases even if a piece was made using CAD and CAM the designer would add detail and carve into the wax before casting and also define the metalwork after casting. Participant 1 explained that even if a mould was made and the piece would be produced in large quantities it would still be handmade, as every piece is still touched by the human hand.

Participants 2 and 3 both agreed that no matter which process has been applied the designer still holds the control. When casting jewellery pieces you the designer operate the kiln and pour the metal. No process is autonomous but rather a tool that aids the designer in the construction of the final piece. In the traditional jewellers' workshop, several advancements have taken place over the decades with little thought given whether that impacts the handmade title of a piece. Most advancements are considered tools to aid the maker's process.

Participant 1 stated that the jewellery industry would most likely never be completely automated. "You will always need the hand touch. The Human." They explained that unless there is a 3D printer that could insert the stones as needed and complete the piece in high polish, you would always need the human to finish and set the piece.

The possibility of direct metal printing was discussed. Participant 3 thought it would be amazing if it was possible. While participants 2 and 4 both questioned the viability of such technology. They displayed doubt in the structural integrity and if you don't have the wax step when would you add organic details to the CAD. Participant 1 explained that their understanding of direct metal printing is that the printer extrudes a metal and resin mixed powder. After printing the resin component is burned away in a kiln. So that would leave you with a porous piece. The porosity makes the process not viable for jewellery purposes but rather more appropriate for industrial applications.

The participants agreed that even though there are major advancements made, this technology would most likely still need the hand and the maker to finish the surface. Participant 4 highlighted that even if technology advances to print perfectly non-porous metal, the maker would still have to set the stones or do the engraving and polish the piece. The process would be no more autonomous than the processes already accessible to the studio jeweller currently.

The next tool discussed was the application of a three-dimensional scanner. The participants claimed that it would help recreate damaged or antique pieces. The scanner would also aid

in ergonomic evaluation to ensure the perfect fit of a jewellery piece. Participants 3 and 4 agreed that it is a viable tool to apply as scaffolding in recreating antique pieces.

The application of CAD and CAM as incipient for a design was also included. Participant 4 explained that they have a design printed and then detail gets added in the wax before casting. The final finishing is then applied after casting. Participant 1 noted that they like to have components made with CAD software and cast, these components are then assembled in multiple different applications by hand.

In this instance, the digital technology creates the framework and the skill of the hand does the refinement and finishing. Participant 4 added that the maker or designer also adds the artistry. Every designer's unique point of view is applied to the piece they are creating irrelevant of the tools they apply. The participants concluded that all the tools discussed could be included in the handmade process as they are all tools to aid the maker. Not one conclusive process was developed but rather the opportunity to create multiple processes to apply to design appropriate manufacturing.

### **4.3 Evaluation**

The evaluation of the processes created during the co-create workshop was originally planned to be part of the workshop. Due to the unknown factor of what the outcome would be, the tool that was prepared beforehand was insufficient for the process created in the workshop. The tool was developed as a rubric to establish which tools fulfil the criteria developed in the first cycle of research. The parameters were established by the thematic analysis of the literature review and the contextual inquiry. The parameters are namely handmade value, designomic application, quality and intrinsic value and provide freedom of design. A new tool was emailed to the participants after the workshop. This rubric included all the tools discussed during the co-create workshop rather than a complete process. The scores provided by the participants were combined in the figure below and the results are discussed after.



## Co-create workshop analysis of digital Processes

Rating of digital processes.

10 being excellent in that parameter and 0 being poor for that parameter.

	Handmade					Designomic					Quality & intrinsic value					Freedom of Design					=
INVESTIGATION & ANALYSIS																					
Participant	1	2	3	4	R	1	2	3	4	R	1	2	3	4	R	1	2	3	4	R	/200
User selection Interface	6	1	5	5	5	7	5	7	8	9	7	3	7	5	5	9	0	2	0	2	98
Visual online presence: social media, website etc.	6	10	10	9	7	8	5	10	9	5	7	8	10	9	8	6	8	10	6	8	159
CREATION																					
Digital sketching tools_free	4	10	8	9	7	6	7	10	9	9	5	7	8	9	8	7	8	6	9	7	153
Rendering software	5	5	10	5	7	10	10	9	9	5	9	5	10	9	7	5	5	9	9	8	151
CAD for casting	7	5	8	5	8	8	10	8	9	8	6	6	8	9	8	6	6	8	9	8	150
Resin model	9	1	9	5	7	9	8	9	6	9	8	6	9	7	7	9	6	8	9	7	148
CONSTRUCTION & EVALUATION																					
Direct metal printing	2	0	2	4	1	5	0	1	5	4	2	0	3	4	1	4	0	1	4	4	47
3D printing Wax	6	2	9	4	8	7	10	8	9	8	6	8	8	8	8	7	8	8	6	8	146
3D printing Resin	6	2	7	4	7	7	10	8	9	8	6	8	8	8	7	7	8	9	6	6	141
Model casting	8	5	10	4	10	9	10	7	9	7	8	7	9	8	8	9	7	9	9	9	162
Laser cutting	8	1	6	3	8	8	5	6	8	9	7	5	8	5	7	9	5	7	6	9	130
Laser engraving	9	4	6	3	7	9	5	6	8	7	8	5	8	5	9	9	5	1	6	9	129

Figure 4.12 Evaluation scores of the digital tools discussed in the co-create workshop. (Greeff, 2021)

The digital tools considered for a new process were evaluated according to the following parameters. The first parameter was the handmade aspect of the process. Could the tool or process be considered handmade and to what degree. The second parameter evaluated was to determine if the process or tool is designomic or cost-effective. Is the tool adaptable to apply to a variety of economic scales? The third parameter measures the quality and intrinsic value the process contributes. The last parameter evaluated is the freedom of design. The tools that have the least design and manufacturing limitations have the highest scores.

#### 4.4 Conclusion

In conclusion, the findings presented in this chapter illustrate that a piece of jewellery could be considered handmade with the use of digital tools if parameters are included in the new framework. In response to the research sub-question 1.3.2.1 What are the processes currently used by Studio Jewellers in the greater Cape Town area, the response was that most apply some digital processes to their practice. It was noted that a lack of knowledge of digital systems played a role in the apprehensive response of some jewellers interviewed. In response to the research sub-question 1.3.2.2 To what extent can Digital Technology tools be incorporated in the design and manufacturing process of authentic handmade jewellery, no definitive consensus emerged but the majority believed to some degree that digital tools require expertise and skill similar to the manual process. "Nothing is simply handmade or machine-made. Everything is a complex mix of different things and I think if we can embrace that complexity, we can do some creative and exciting things" (Interviewee 4, 2021). The opinion of another jeweller was that the tools applied is not what is important, but rather the maker's mark should be evident in the final product for the wearer. In the following chapter, the data will be discussed and analysed to provide the studio jeweller with insight to stay relevant and competitive within the post cyber design space.

## 5. Chapter 5

### Discussion

#### Introduction

The cyber revolution has emphasized the dialogue regarding perceptions of value between the mechanically produced and the handmade jewellery piece. The cyber revolution can be described as the blurring of boundaries between the physical, digital, and biological worlds. The fourth industrial revolution industrializes artificial intelligence to enhance production and manufacturing. The application of modern digital design technology with traditional methods of working by hand in the studio jewellers' practice raises questions of authorship, authenticity, and craftsmanship.

In the literature, Fuchs et al (2015) reveal that in the digital age, technology is developing at a rapid pace and that in the future manual jewellery design and manufacturing processes could be eliminated. To date, however, there are no jewellery making processes that exclude manual labour entirely. The rapid development of technology could impact the future sustainability of the studio jeweller in their ability to remain viable in terms of price, time, material consumption, variety and complexity of design afforded by digital processes (Cooper, 2015). In turn, this has a direct bearing on the design curriculum at higher education institutions preparing graduates with the necessary skills to enter the workplace.

The research aimed to explore the incorporation of digital design technology into the studio jewellery design and manufacturing process of bespoke jewellery. A basic framework was developed to find the balance between technological advancement, mass production, the continuity of tradition and the function of the Studio Jeweller in the jewellery industry.

The research objectives set out to provide an improved understanding of the Studio Jewellery sector today and how it might evolve in the future to establish a basis to identify and develop new processes for the Studio Jeweller in the post cyber revolution market. In an attempt to answer the following research questions:

- i. What are the processes currently used by Studio Jewellers in the greater Cape Town area?
- ii. To what extent can Digital Technology tools be incorporated in the design and manufacturing process of authentic handmade jewellery?



- iii. How does the Cape Town Studio Jeweller mitigate the complexities of incorporating digital design technology into the traditional process associated with the handmade jewellery piece?

In this chapter, I discuss the findings presented in the previous chapter, from the contextual inquiry and the co-create workshop. The analysis of the data gathered during the literature review and the contextual inquiry was applied to conduct the co-create workshop. During the workshop participants, utilizing a design charrette, set out to create a design and manufacture process for the post cyber designer that prescribes all the parameters highlighted by the contextual inquiry and literature review.

## **5.1 Current practise of Studio Jewellers**

### ***5.1.1 The Importance of handmade in current practise***

The importance of the term handmade was discussed in the context of each jeweller's practice. It was interesting to note the extreme points of view. For one interviewee every aspect of their business is handmade. From the design sketches to the packaging.

Some jewellers in contradiction to this have moved away from handmade completely as that title has had some associations to poorly made items. These jewellers believe that the branding of how it was made is not the most important. The service providers reiterated that by including that the method is not important, but rather the quality of how it was made and the aesthetic that the customer desires. Methods change the aesthetic. These sentiments are emulated in the literature by Simptani & Barrett (2020) and Norton (2004)

Two jewellers interviewed have moved away from hand-making completely as that title has had some associations to poorly made items. These jewellers' opinions were that the branding of how it was made is not important. The service providers reiterated that the method is not important, but rather the quality of how it was made and the final aesthetic.

In contrast to these opinions, four jewellers emphasize the importance of handmade to their practice. They describe the practice of making as a journey they embark on with every piece, as there is something spiritual about handmade jewellery as it engages with the human body.

Another jeweller mentioned that the allure lies in the exclusivity of the handmade and another opinion was that the handmade process provides the jeweller with control over every step, which adds a layer of authenticity. They reiterated that machines may be able to do things humans cannot, but the touch or the 'mark made by the human hand is where the magic lies' (Interviewee 5). That unique mark left on each piece is what makes handmade valuable and exclusive. Fuchs, Scheier & Osselear (2015) along with Lico (2014) stated that the value appreciates as the piece is worn. This connects to the idea of emotional design and the connection the designer and the consumer form on their journey, creating a piece of jewellery (Interviewee 4).

### ***5.1.2 Application of digital tools in current practise***

The digital tools used by the scope of jewellers interviewed were similar, but the application of the tools and why it was selected, were varied throughout the complete design process in each practice. Digital design software is used for illustration purposes by most jewellers interviewed. There is the application of complex three-dimensional design software like Rhinoceros as well as the application of simple software like a quick sketch on a tablet device and Photoshop to create a realistic effect. Jewellers who intend to produce the finished piece employing computer-aided manufacturing will apply three-dimensional software and render the design with plugin applications or Photoshop to present the design as a realistic illustration.

Digital design drawing tools have also been incorporated into the handmade process of push-engraving. It was interesting to note that the hand engraver would apply a digital method to transfer a design to the piece that needs to be engraved. They explain how they would transfer the design using light laser engraving, in this instance opposing technology work in sync to create better economic value.

Digital tools used in the making of sections of the process included microscopes for improved precision. The jewellers who applied CAD and CAM in their making process had different approaches to how these technologies should be applied authentically. It was interesting to note that some jewellers outsource the CAD section of their process as they are not versed in the software, but still employ the technology. The CAM process is usually outsourced as it is rare for studio practice jewellers to have the large scale equipment personally. Other technologies noted in the making section of the process were laser-based options such as micro-welding, laser welding, laser engraving and laser-cutting. These technologies are usually employed on an outsource basis to solve design-based problems.

### ***5.1.3 Digital tools for the future***

The jewellers were asked if there were any tools that they would like to incorporate into their practice. This could be any tool or process that could aid the jeweller in their studio.

Jewellers noted that even though there are many options for illustrating designs, most of them are time-consuming to apply to three-dimensional renderings. There is a need for design software for fast and realistic renderings to illustrate ideas to customers. A large selection of the interviewed jewellers felt that there is a lot of technology available to them, they simply chose not to apply it in their practice, because they prefer to work by hand only.

Direct metal printing is a technology noted by some jewellers that need to be explored. The technology already exists, but the application to the jewellery industry should be explored. Metal printing was noted as an option for the manufacturing of titanium rings specifically as it is such a difficult metal to work with by hand.

### ***5.1.4 The current processes of studio jewellers***

Each participant was asked to describe their process from conceptualization to production. This question was included to gain a better understanding of the workshop practice of each individual. The individual processes as explained by the jewellers, allowed me to experience what it would be like to have a piece made by each of these jewellers. It was interesting to note how personal this process is for most of the jewellers. It is described as a journey.

Jewellers follow a process of investigating, conceptualizing and making as described by the illustration below. This basic process is adapted with unique steps taken and a variety of tools applied with each stage of their process. The illustration below demonstrates how the general process relates to the theoretical process provided by the literature (Batista, 2012). The first phase of the process is documented as organic according to the business structure of each studio jeweller. The suggested tools that could be incorporated is to eliminate the face-to-face engagement with the consumer and apply a web-based user interface.

The creation phase of the process is where the idea will be created and presented to the client. Traditionally this would occur through hand sketches. Jewellers alluded that they have started to incorporate digital drawing software at this stage. There are multiple options available for lithographic drawing and full three-dimensional drawing. These are all rather time-consuming and there is still a need for software that will allow for the rendering of three-dimensional sketches at a faster pace without a high skill level.

Construction and evaluation have the most potential for the inclusion of digital technology. Models could be produced in wax as a realistic example or as a working model. Threedimensional printing can be used as a starting point for a complex design or a design can be printed in full detail ready to cast. These decisions will be determined by the economic implications and the complexity of the designs. The possibility to explore what other purposes this technology could be used for and wherewith the design process would have the greatest positive effect.

Direct metal printing is a new technique that is not currently used for jewellery manufacturing in Cape Town. The jewellers I interviewed viewed it as something worth exploring to mitigate the difficulties of working in non-precious metals like titanium. These techniques could broaden the possibilities of design as the material and production could be more cost-effective. Laser welding and micro soldering are used for specialised intricate designs. It aids in the possibilities of broadening the boundaries in which we design. These were some of the tools that were mentioned during the interviews that could be incorporated within the new processes.

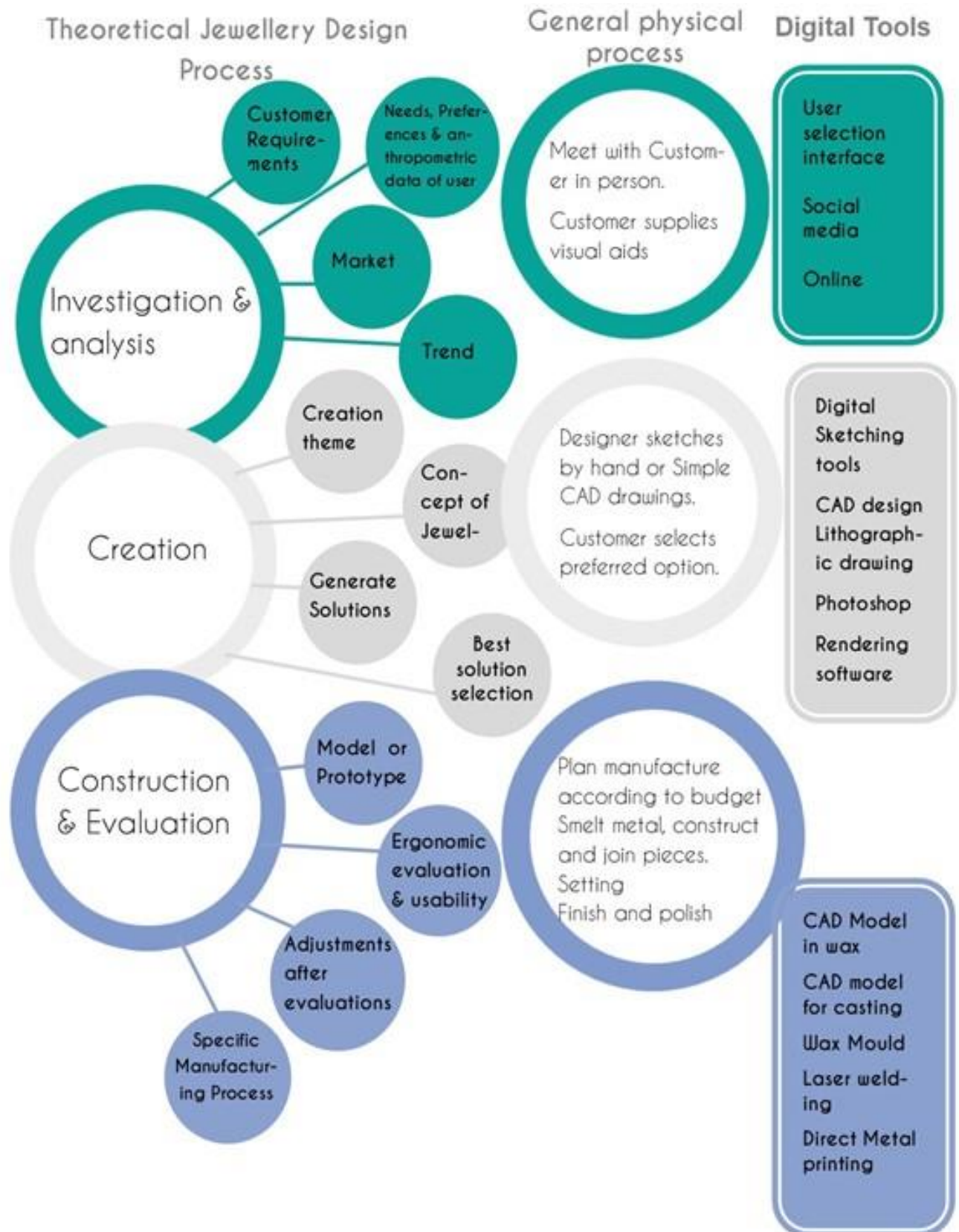


Figure 5.1 Towards a designomic framework for the post cyber studio jeweller (Greeff, 2021).

The employment of outsourced based manufacturing was approached. Digital tools are costly and it makes economic sense to outsource the application of these tools rather than carry the cost of running and maintenance of these tools. It is considered common practice in the jewellery industry to outsource the casting of pieces to companies that specialise in that section of the industry. Another section that has emerged is the outsourcing of CAD designs. It emerged from the interviews that most jewellers, those who apply technology and those that don't, do not have the skills for engaging with CAD software and employ an independent contractor to complete these tasks.

### ***5.1.6 Impact of Covid-19 on the studio jeweller***

The impact of lockdown restrictions had an impact on every aspect of life in South Africa. The studio jewellers interviewed during the contextual enquiry had different experiences to share. The studio jewellers who had their studios at home felt minimal disruption during the pandemic. There was a decline in sales, but they could continue their service with little disruption. The service providers who were interviewed could provide limited manual services from home and resume normal services once it was allowed. The studio jewellers who have traditional stores and workshops had to make the most changes during this time. One jeweller explained that all staff had to be retrenched and they had to divert manufacturing to outsource based services once they were allowed to resume business. Another jeweller interviewed explained that they could move to an online space exclusively, and resume their business once restrictions were lifted.

## **5.2 Authentic handmade jewellery with Digital processes**

In this section, the results of the co-create workshop are discussed. The designers determined what the parameters would be for the inclusion of digital processes into the creation of handmade jewellery. These parameters would need to ensure that the final product would be made with the same control as a traditionally handmade product would have. Handmade jewellery is often synonymous with authenticity. Sennett (2008:149) believed that authenticity lies in the uniqueness of the imperfections that prevent replication of products. The inclusion of digital processes should then aim to result in authentic pieces that are difficult to replicate yet free from traditional manufacturing constraints.

### *5.2.1 Handmade jewellery with digital processes*

To determine what the parameters of the digital handmade process could be, the jewellers were asked to what extent they think digital technology can be incorporated into the handmade process. It was interesting to note that the opinions were not concrete and that they varied from no digital application in the process at all to some jewellers saying that a mixture of processes will allow for the handmade title to stand in place. The authenticity of feel is also a comment made by some, meaning that if the piece attains the feeling of being handmade, irrespective of process, it is still handmade. The results of any applied process should yield a unique piece of high design and intrinsic value.

A selected group thought that CAD and CAM could be included in the handmade process, but with conditions. Computer-aided design tools can be incorporated for presentation and manufacturing purposes. CAD has multiple roles in the jewellery workshop. It can be used for design illustration purposes or it can be used to create the files used for printing 3D models for CAM. CAD can also be used for design mapping for stone layouts or engraving details or to create symmetrical angles in traditional manufacturing. Parameters and limitations for the use of CAD for CAM in the handmade process noted by the jewellers during the contextual inquiry were the following:

1. Design should be sculpted with the mouse and not use preset pieces.
2. No preset stones in the wax.
3. Pavé and micro setting should only be mapped and drilled. No presetting and cutting of settings should be applied in the CAD file but rather done in metal.
4. Complex pieces should be drawn in separate pieces to ensure proper polishing and finishing in the final product.

Digital tools and processes like laser engraving, laser welding and laser cutting were still considered handmade. The jewellers believed that these processes involve the human hand throughout and can be incorporated into the process of handmade jewellery as it is a step in the creation of a piece and not the entire process. Digital tools that are seen as aids to the manual process that were mentioned during the interviews were pneumatic engravers and microscopes, which assist with the manual process.

### ***5.2.2 Co-create workshop participant discussion***

Participants in the co-create workshop established that there is a place for any digital tool within the studio jewellers repertoire. The application of digital tools is no different from the advancements made in other tools over the years. The skill of the goldsmith is still what applies the tool. No digital tool that exists functions autonomously, thus it requires the hand of the jeweller or maker to function. The applications of tools within the conceptual framework of Batista's (2012) design process established which tools could assist the studio jeweller to produce handmade jewellery of the highest quality and intrinsic value with complete design freedom and designomic costing.

The participants agreed that most of the digital process can with enough knowledge be applied to the handmade process as the knowledge and the hand of the designer is still the augments of the tool. It was the collective opinion of the workshop that no artificial intelligence or digital application tools could replace the ideas or the skill of the jeweller/designer/goldsmith. These technologies and advancements simply assist or aid the user in the process of creating, it does not do the creating for the jeweller/designer/goldsmith.

### ***5.2.3 Evaluation of digital processes***

The co-create workshop assessed the digital processes and the results of the quantitative rating that each process received from the participants are illustrated in the figure below. The processes were evaluated according to how well they are suited to the parameters of handmade, designomic, quality and intrinsic value and freedom of design. The processes are discussed with the stage of the design process they will most likely be applied.



## Co-create workshop analysis of digital Processes

Rating of digital processes.

10 being excellent in that parameter and 0 being poor for that parameter.

	Handmade					Designomic					Quality & intrinsic value					Freedom of Design					=
INVESTIGATION & ANALYSIS																					
Participant	1	2	3	4	R	1	2	3	4	R	1	2	3	4	R	1	2	3	4	R	/200
User selection Interface	6	1	5	5	5	7	5	7	8	9	7	3	7	5	5	9	0	2	0	2	98
Visual online presence: social media, website etc.	6	10	10	9	7	8	5	10	9	5	7	8	10	9	8	6	8	10	6	8	159
CREATION																					
Digital sketching tools_free	4	10	8	9	7	6	7	10	9	9	5	7	8	9	8	7	8	6	9	7	153
Rendering software	5	5	10	5	7	10	10	9	9	5	9	5	10	9	7	5	5	9	9	8	151
CAD for casting	7	5	8	5	8	8	10	8	9	8	6	6	8	9	8	6	6	8	9	8	150
Resin model	9	1	9	5	7	9	8	9	6	9	8	6	9	7	7	9	6	8	9	7	148
CONSTRUCTION & EVALUATION																					
Direct metal printing	2	0	2	4	1	5	0	1	5	4	2	0	3	4	1	4	0	1	4	4	47
3D printing Wax	6	2	9	4	8	7	10	8	9	8	6	8	8	8	8	7	8	8	6	8	146
3D printing Resin	6	2	7	4	7	7	10	8	9	8	6	8	8	8	7	7	8	9	6	6	141
Model casting	8	5	10	4	10	9	10	7	9	7	8	7	9	8	8	9	7	9	9	9	162
Laser cutting	8	1	6	3	8	8	5	6	8	9	7	5	8	5	7	9	5	7	6	9	130
Laser engraving	9	4	6	3	7	9	5	6	8	7	8	5	8	5	9	9	5	1	6	9	129

Figure 5.2 The combined ratings of the digital processes analysed in the co-create workshop (Greeff, 2021).

### 5.2.3.1 Investigation and analysis

Two processes or tools were discussed to aid the designer within this stage of the creation process. The user selection interface, which in simple terms would be an app that the consumer could build their design using basic parts. It would give the consumer an idea of what the product could look like. They would have limited options to play with. The example

discussed in the workshop was applied to a simple engagement ring. The user or consumer would be able to make a selection between different setting styles and ring shanks to generate a design. This process is rated low under freedom of design as it intends to limit the consumers' options. It also faired low within the handmade parameter as the designs would be generic in style. As for quality and intrinsic value, there were mixed ratings. You could deliver a quality product with this application but it would not be intrinsic in design. This process is rated high in designomic application as it is intended for the lower retail price consumer. It is a process that could be applied well to small profit margin items as it requires less time from the studio jeweller.

The second tool or process discussed was the Studio jewellers online presence. The concept is that studio jeweller is in control of the target market they reach by controlling their online presence. This includes social media, websites and stockists. The participants noted that if the visual presentation you create is aligned with your creative ambitions, then that would direct the appropriate consumer to your studio.

### **5.2.3.2 Creation**

The digital tools that could be applied to the creation phase consisted of the following:

1. Digital sketching tools
2. Rendering software
3. CAD for casting
4. Resin models

Digital sketching tools, like the free software on an iPad, rated high within the parameters of all four sections. The software could easily be applied to sketch original designs that fulfil the values of designomic and handmade jewellery with design freedom and as this tool is not applied to the making or manufacturing of a piece the quality is not rated but rather the intrinsic value of the design capabilities. This software is capable of creating a sketch as detailed as one drawn with a pencil on paper. It is the skill of the user that is required to create a sketch that executes the above parameters well.

Rendering software is more complex than sketching tools. These tools are usually paid software that requires a fair amount of skill to apply. Under the handmade parameter, this tool scored very low as this will provide the designer with a digital recreation of the design and not a hand-painted sketch. Even though rendering software is expensive to purchase, the participants were of the view that it has a designomic contribution to make to the studio jewellers services. Freedom of design and quality and intrinsic value received mixed ratings. These factors will be determined by the operator's ability to apply the software.

Computer-aided design (CAD) for casting is rated as a valued tool overall. Participants agreed that if applied in the creation stage of a design, as an illustration, tool, it makes economic sense to then apply as a manufacturing tool. The application of this tool is mostly outsourced by participants to skilled experts.

Resin models require a CAD design to be rendered. Participants agreed that if the time or monetary investment was made to draw a design in CAD, it is viable to print a resin model to show to a consumer. Resin models are designomic in costing and provide the consumer with an actual example of the product they commissioned before it is made in metal.

### ***5.2.3.3 Construction and evaluation***

The following six tools were explored during the co-create workshop for application in the construction and evaluation phase of the design process:

1. Direct metal printing
2. 3D printing in wax
3. 3D printing in Resin
4. Model casting
5. Laser cutting
6. Laser engraving

Direct metal printing is a relatively new technology in the jewellery industry. Participants felt that even though it could provide some design freedom when working with difficult metals like titanium. It will also provide a designomic solution to working with metals like titanium and stainless steel. These metals are lighter and economical alternatives for traditional gold rings for men. For application to precious metal, it was deemed not viable for the production of quality pieces with intrinsic value. This process was rated very low for its handmade capabilities as handmade refers to well-made pieces. Direct metal printing will leave a porous finish and a dull finish.

Computer-aided manufacturing in the jewellery industry currently applies two printing methods. The first is wax printing. Wax printing have few limitations for the manufacturing of jewellery which provides the studio jeweller with design freedom. The casting results from a wax printed model is of high quality and intrinsic value. This process is designomic due to lowered manufacturing time. The process is considered handmade by some of the participants, others felt that the process removes the authenticity of the model is cast as it was printed. Participants believed that if the wax printed model is applied as scaffolding for a design, it will raise the handmade quality of the piece as well as the design freedom of both the CAD process and the final product. When the process is applied as a tool and not as the entire manufacturing process it is capable of authentic handmade jewellery.

Resin printing is fundamentally similar to wax printing when referring to cost. Resin printing provides a stronger material that has greater handling and casting capabilities, but also limitations in design as it is printed upside down in most cases. Resin printing does not allow for the designer to carve and work on the printed model as its wax counterpart does, which lowers the processes handmade capabilities. The process or tools can be applied well for high-quality jewellery and is designomic.

Model casting was the tool or process that rated the highest amongst the participants. The process has a multitude of applications. The process is inclusive of many of the other tools discussed, but the model cast is not the final product. The model would most like to be applied as an example of a piece or the basic scaffolding or part of a design that could be produced in larger numbers to be assembled in a customized manner. Models are not finished products but rather a part within the process that aids the maker in the construction stage of the process. Model casting provides the designer with freedom of design as it can be assembled from different processes. The model can be moulded and then reproduced in wax to cast to the individual requirements of the consumer which raises the quality and

intrinsic value of the process. The handmade qualities of the product remain high as the process requires constant interaction with the hand of the creator. The designomic principles of this process can be low if it is applied to a singular commissioned piece, but when applied to the creation of a range of jewellery the cost is absorbed with the process of the entire range.

The participants singled out two laser tools in the construction and evaluation stage of the design process. Laser cutting and laser engraving were rated similarly in that they are designomic and deliver quality and intrinsic value. Both processes involve the creator as the operator of the equipment which adds to the handmade quality. Laser engraving and cutting provide design freedom within the capabilities of the operator. A skilled operator would be capable of complex designs with these tools.

### **5.3 The Proposed new framework**

The post cyber revolution world will bring opportunity for the studio jeweller to grow and push the boundaries of design, alongside its challenges. The participants agreed that a new process will not be a singular one but rather a framework that can take a variety of pathways to solve design-based solutions and provide the consumer with the highest quality product at a designomic price point. Any digital tool could form part of the repertoire of the studio jeweller if applied as such. The studio jeweller should retain control over the process to ensure the maker's mark is evident on a handmade piece. The figure below illustrates what the new framework could be. The jeweller could great multiple pathways to the final product selecting processes from left to right.

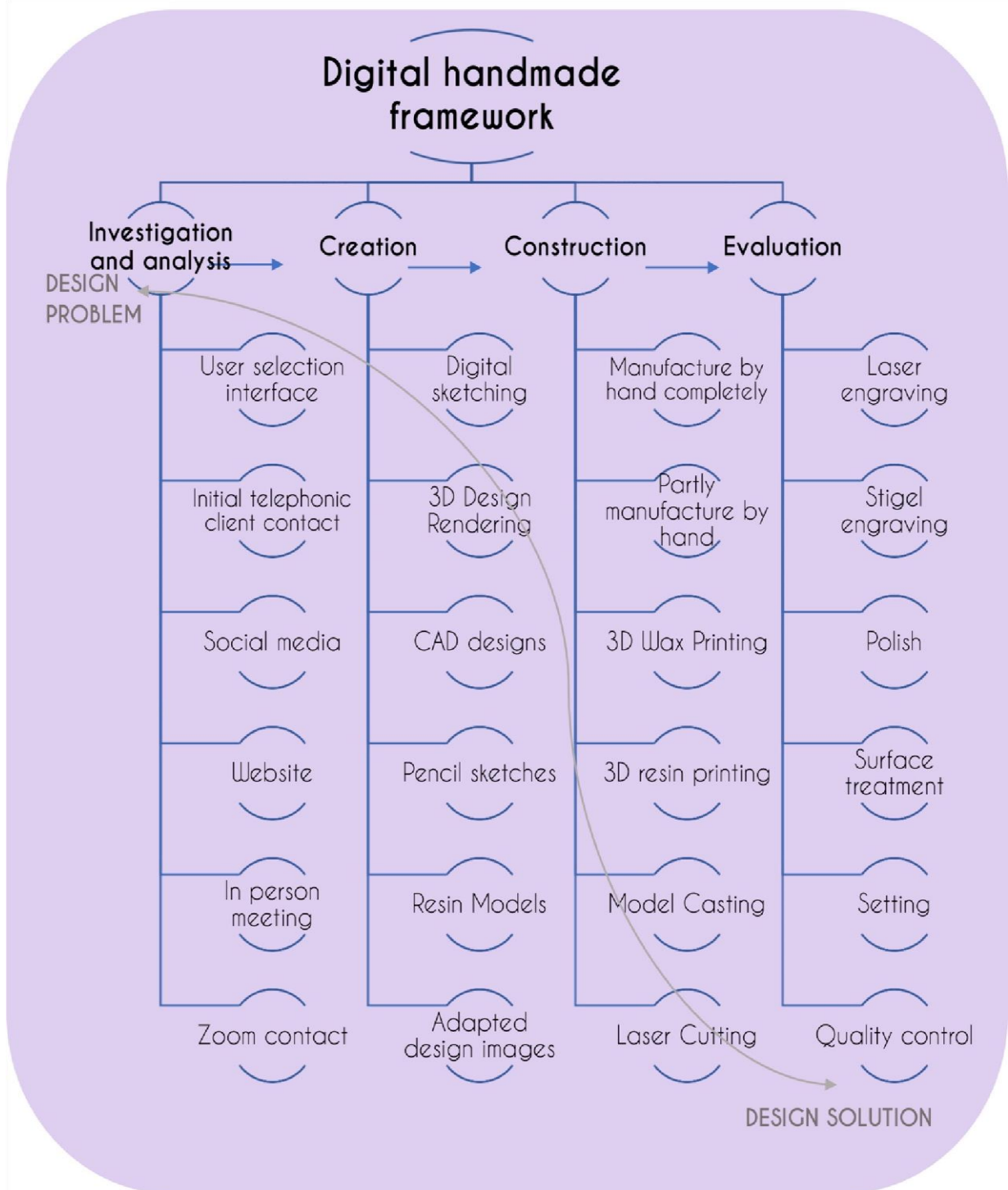


Figure 5.3 Digital framework for the future studio jewellery process (Greeff, 2021).

## 6. CHAPTER SIX

### Conclusion and recommendations

#### 6.1 Overview

The cyber revolution and the advancement of technology it produced, has profoundly influenced the broader jewellery industry in both manufacturing and design processes. It has highlighted the continuous conflict concerning perceptions of value between the mechanically produced and the handmade jewellery piece. Orlandi & Erkan (2015) viewed this evolution as an opportunity for jewellers to evolve and grow. The studio jeweller is essential to the broader industry for the design and manufacture of bespoke pieces of jewellery underpinned by the individual design aesthetic of the designer and the personalised requirements of the consumer. This study explored the challenges of creating handmade jewellery within the context of the post cyber revolution and the application of digital technology with the traditional practices of the studio jeweller.

Fuchs, Schreier and Osselear (2015) identified that the consumer attaches a perceived higher value to handmade jewellery and deems it authentic. This perception elevates the importance of the term handmade to the practice of studio jewellers and the specialized market they serve. The concept of what is considered handmade has been redefined and the definitions have blurred with the innovation and digital processes (White, 2004). Most production processes require some human involvement and traditional methods incorporate machine assistance in some way. These overlaps make it difficult to objectively label a product as completely handmade or machine made which creates an opportunity to present it as either and blur the lines.

For the studio to stay competitive in a hyper-consumerist environment they would have to consider the designomics of their product. Designomics is the collective term for design and economics. In most traditional processes the intricacy of a design is directly linked to the cost, Cooper (2015) believes that this cost could be lowered with the application of digital design. Dauriz et al (2019) explain that the studio jeweller will at some point be influenced by fast fashion and should consider improved supply chains to ensure competitiveness. Cooper (2015) believes this could be achieved with the inclusion of digital processes.

Autonomy from manufacturing restrictions and costs could also be achieved with the inclusion of digital design technology. Most design processes apply the design for manufacture approach where you consider the manufacturing of the product in the early stages of design. With expanded capability, the use of both handmade skills and digital technology, the designer could potentially access autonomous design capabilities.

The exploration of where the intersection between the traditional, digital and cyber-physical system would be, revealed that the foundation of every creator will always be traditional. The participants established that the digital tools available currently are simple tools that could be applied as an aid to the studio jeweller in their practice. The autonomy of how and where they are applied will determine the authenticity of the piece. Cyber-physical systems within the studio jewellery space are still limited in the creation and production of authentic jewellery. These systems are applied in the strategic marketing and social media applications that connect the consumer to the designer. In the post cyber revolution space, the studio jeweller will function in a continuous beta state as described by Ziegler (2020).

To address the conflicts of consumer perception and authenticity in the digital age, the designer needs to adapt their design process. The research applies the theoretical model developed by Batista (2012) as the foundation of a new process inclusive of digital design and manufacturing technology. The new process aims to mitigate the complexities of incorporating digital design technology into the traditional process associated with the handmade jewellery piece and utilizing the available cyber-physical systems to enhance their practice and business. Finding a balance in technological advancement and the continuity of tradition for the Studio Jeweller in the jewellery industry.

## **6.2 Research Questions**

How does the Cape Town Studio Jeweller mitigate the complexities of incorporating digital design technology into the traditional process associated with the handmade jewellery piece? Conducive to answering this question the research explored the following subquestions:



### ***6.2.1 Sub-question 1.3.2.1: What are the processes currently used by Studio Jewellers in the greater Cape Town area?***

The contextual inquiry conducted during the first cycle of participatory action research identified the processes jewellers apply in their current practice. The results were that some jewellers apply digital design technology within their practice, but most are not trained to apply these technologies themselves. The majority of jewellers who participated in the research outsource their CAD and CAM components to experts in the field. The jewellers who are averse to digital technology gave the following reasons for their opinion, namely the lack of control and the lack of feel. They prefer to touch and make their mark on the metal throughout the process, and that is fundamental to their creating process. The idea that the jeweller's aura is connected to the piece as stated by Benjamin (1998) is mirrored. The data revealed that a lack of knowledge of the digital processes available and how they could be applied also made some jewellers reluctant to consider them as viable. Creating a better understanding of digital tools within the education of jewellers will enhance the skills of the studio jeweller and empower them to appropriate a larger repertoire. The literature recapitulates this notion with the authors Bernabei et al (2015), Forsman & Solitander (2004) and Lico (2014).

### ***6.2.2 Sub-question 1.3.2.1 To what extent can Digital Technology tools be incorporated in the design and manufacturing process of authentic handmade jewellery?***

This question was raised during the contextual inquiry as well as the co-create workshop. No definitive consensus emerged but the participants all believed to some degree that digital tools require expertise and skill similar to the manual process. "Nothing is simply handmade or machine-made. Everything is a complex mix of different things and I think if we can embrace that complexity, we can do some creative and exciting things" (Interviewee 4, 2021). The opinion of another jeweller was that the tools applied are not what is important, but rather the maker's mark should be evident in the final product for the wearer. This reiterated the literature where White (2004) notes that hybrid practice is viable and Simptani & Barrett (2020) explained that if the consumer's perceptions are steered to understand the authenticity in use of digital design, the designer will be able to apply more tools within the handmade space.

A piece of jewellery could be considered handmade with the use of digital tools if the following considerations are included within the proposed new framework:

1. The design should be authentic.
2. The mouse, not pre-set design algorithms, should be used to sculpt.
3. Digital design and manufacturing should be applied as scaffolding and not to create the finished product.
4. Setting should be done manually.
5. The final finishing should be done by hand.
6. Control over the process should remain in the hand of the designer.
7. Quality control inspection should be done.

### **6.3 Research method**

Participatory action research was selected, which allowed the subject to collaborate with the researcher in solving a problem faced by their community. Studio jewellers and the researcher work together to find a solution based on the iterative reflective cycle. The reflective cycle applied Schön's theory of reflective practice (1983) as a lens to explore the incorporation of digital design technology into Studio Jeweller's repertoire. Reflective practice is the ability to reflect on one's actions to engage in a process of continuous learning. Schön distinguishes reflection during the event and reflection after the event. The participants answered the research questions through the reflection of their practice.

The research explored two cycles of participatory action research. The first cycle identified the processes currently used to create authentic handmade jewellery and establish to what degree they involve digital processes in the greater Cape Town area. A snowball sampling (Parker, Scott & Geddes, 2019:1) method was used to identify participants. The first five possible participants were contacted from a Facebook group for jewellers in Cape Town of which I am a member. From there we contacted possible participants based on referrals. A contextual inquiry was conducted through semi-structured interviews within the participant's studio.

The second cycle applied the knowledge gained and analysed during the contextual inquiry and applied it in a co-create workshop. The participants were contacted from the list of referrals collected in snowball sampling. The co-create workshop applied a design charrette

(Day, 2003) to explore a possible new framework for the studio jeweller. Participants discussed and evaluated the tools and processes that could form part of a new framework.

Data collected in both cycles of research were transcribed and analysed thematically. Atlas-Ti software was used to aid in the analysis of the transcribed data (Maguire & Delahunt, 2017). The analysis and coding applied the six-phase approach to thematic analysis (Braun & Clarke, 2012).

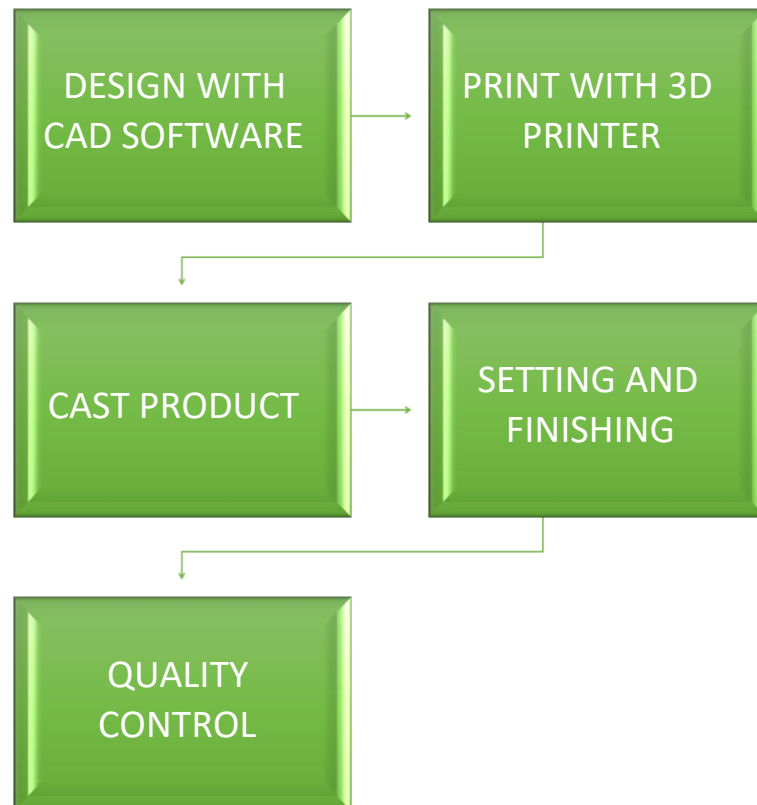
Participatory action research allowed for a user-centred approach to apply to solving a design based problem. The participants are the ones affected by the problems identified and they should be involved in finding the solutions. Applying a participatory action research method with Schön's theory of reflective practise (1983) was found to be a well-structured process that offered a multitude of tools to address the main research question.

## 6.4 Findings

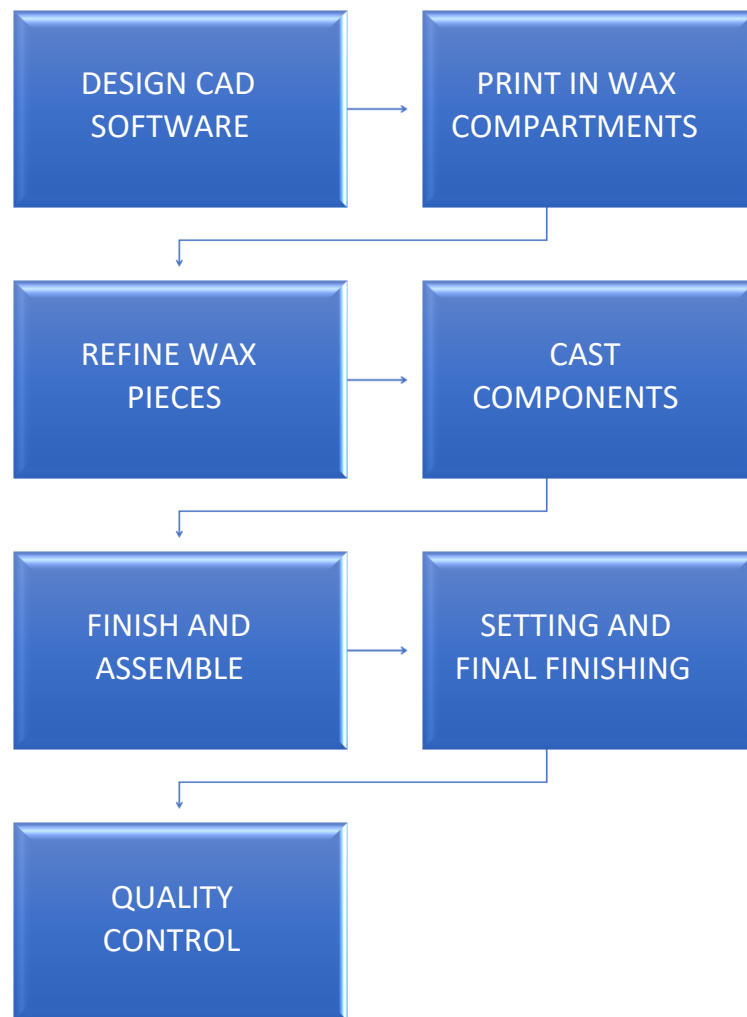
The first cycle of research revealed that some jewellers are already applying the digital technology available to them in their practice. It was identified that there is a lack of training in digital technology. A deeper understanding of the digital processes is required for the jeweller to utilize its capabilities to capacity. This was encapsulated in the literature by Hague (2006), Corti (2003) And Bernabei (2015). The jewellers that are currently applying the technology are prone to outsourcing due to a lack of skill. Secondly, it was identified that jewellers who are completely unfamiliar with the processes related to digital design technology are more reluctant to consider it as a viable option for their practice. Brepohl (2001) noted that craftsman should constantly re-evaluate their tools to ensure that they take advantage of everything available. Continued professional development will address the lack of knowledge and aid in clarifying the misconceptions related to digital and cyber-physical systems within the studio jewellers practice.

The co-create workshop during the second cycle of research concluded that most digital processes can be applied within the practice of handmade jewellery. The participants noted that if these processes are applied as a tool to complete design based tasks it is still authentic and can be considered handmade. The tools should not be applied as complete processes. An example of this is illustrated in the figures below. The process in Figure 6.1 is

considered to be automated because the process is augmented with technology with little intervention by the designer, thus it cannot be considered as part of the studio jewellers toolkit. While the process was on the right, the designer applied the same tools, yet the control and authority remained with the designer. The tools are applied in a way to aid the designer to create the best possible product.



*Figure 6.1 Example of Machine-made CAD and CAM process (Greeff, 2021)*



*Figure 6.2 Example of CAD and CAM application in the handmade process (Greeff, 2021)*

The combined finding of the two cycles of participatory action research concluded that the new framework has infinite possibilities. The future processes will continuously adapt and change with the technology if applied with the principle of it being a tool to the studio jeweller, rather than an automated process that controls the outcome of the final product.

## **6.5 Contribution to the field**

The research provides the studio jeweller with tools to aid them to stay relevant and competitive in the post-cyber society. The framework developed during the research allows the studio jeweller to experiment with new tools and processes that could lower the cost of production, elevate the possibilities of design geometry and enhance production. The

parameters of these processes are adaptable and can be customized to the requirements of each jeweller.

The research highlighted a need for time-efficient professional development in the field of jewellery design. The digital landscape changes at a rapid pace, these rapid changes date knowledge quickly. Opportunities for short professional development programmes are required for jewellers to keep up with the tools available to them.

## **6.6 Recommendations for further research**

The recommendation for further research would be to apply the third cycle of Participatory action research. This cycle would test the results of the second participatory action research cycle as illustrated in figure 5.3. The multiple possibilities of application will be assessed according to the principles established in the literature review and the contextual inquiry. The analysis will determine to what degree these processes are viable for the studio jeweller to apply to the design and manufacturer of authentic, designomic, jewellery that retains the handmade allure (Fuchs, Schreier, & Osselaer, 2015:100) (Hashim, 2018: 24) (White, 2004:10).

The second recommendation for further research would be to explore postgraduate skills development programs for studio jewellers. The rapid advancement of technology has illustrated that information and knowledge is constantly changing. The practising studio jeweller needs to be able to keep up with this advancement in technology. A professional development program could aid designers in staying current.

The application of artificial intelligence within the jewellery design and manufacturing industry should be researched. As artificial intelligence develops it has displayed both positive and negative repercussions to other design fields (Manovich & Arielli, 2021). Some research has been done on the application of algorithms in the mass-production of jewellery (Demarco et al, 2020), but not within the bespoke design and construction application.

## **6.7 Concluding remarks**

This study into the rapid changes and challenges faced by the studio jeweller was conducted during the covid-19 pandemic, which altered the foundation of how most of us live, work and create. The in-depth planning of the study done during the proposal phase had to become fluid to adapt to the challenges imposed by the various lockdown regulation and availability of participants. These challenges highlighted the resilience of the Cape Town jewellery industry for me and inspired me to persevere.

## REFERENCES

- Adamson, G., 2013. *The invention of craft*. 1st ed. London: Bloomsbury Academic/V&A Publishing.
- Adamson, G., 2018. *Thinking through craft*. 1st ed London: Bloomsbury Publishing.
- Aheto, S.P.K., 2017. *Patterns of the use of technology by students in higher education*. Doctoral dissertation, University of Cape Coast.
- Barthes, R., 2001. *The death of the author*. Contributions in Philosophy, 83, pp.3-8.
- Batista, C.R., 2017. *A contribution for Jewelry Design Teaching*, The Design Journal, 20:sup1, S4726-S4729, DOI: 10.1080/14606925.2017.1352973 [Accessed 17 May 2021].
- Bender, A., 2013. *The Color Master*. Random House.
- Benjamin, W., 1998. *The work of art in the age of mechanical reproduction* (p. 96). Marxists.org.
- Bernabei, R., 2011. *Contemporary Jewellers: Interviews with European Artists*. Illustrated ed. London: Berg publishers.
- Bernabei, R., Cappellieri, A. and Tenuta, L., 2015. *CAD/CAM and jewellery design education*. Making Futures Journal Vol 4. Plymouth College of Art. Available from: <http://makingfutures.plymouthart.ac.uk/2015/> [Accessed 19 August 2019]
- Bernabei, R., 2014. *Digital jewellery: the democratization of authorship and ownership*. Craft Values in 21st Century Production. Conference Proceedings, Falmouth University, 11 July 2014, Conference Journal1, pp.17-22. Available from: [https://www.researchgate.net/publication/280877612\\_Digital\\_Jewellery\\_The\\_Democratisation\\_of\\_Authorship\\_and\\_Ownership](https://www.researchgate.net/publication/280877612_Digital_Jewellery_The_Democratisation_of_Authorship_and_Ownership) [Accessed 24 January 2020].
- Braun, V. and Clarke, V., 2006. *Using thematic analysis in psychology*. *Qualitative research in psychology*, 3(2), pp.77-101.
- Brepohl, E., 2001. *The theory and practice of goldsmithing*. 2nd ed. University of Michigan: Brynmorgen Press.
- Chen, H., 2017. *Applications of Cyber-Physical System: A Literature Review*. Journal of Industrial Integration and Management 02 (03): 1750012. Available from: <https://doi.org/10.1142/s2424862217500129> [Accessed 21 February 2020].
- Coghlan, D. 2019, *Doing action research in your organization*, 5th ed. SAGE Publications Ltd, London.
- Coghlan, D., and Brydon-Miller, M. 2014, *The sage encyclopedia of action research*, vol. 2, SAGE Publications Ltd, London, DOI: 10.4135/9781446294406 [Accessed 27 January 2020].
- Cooper, F., 2015. *Sintering and Additive Manufacturing : The New Paradigm for the Jewellery Manufacturer*. Johnson Matthey Technology Review, Volume 59, Number 3, July



2015, Pp. 233-242. Available from: [https://www.technology.matthey.com/article/59/3/233 - 242/](https://www.technology.matthey.com/article/59/3/233-242/) [Accessed 10 October 2019].

Cornwall, A. and Jewkes, R., 1995. *What is participatory research ?*. Social science & medicine, 41(12), pp.1667-1676. Available from: [http://www.academia.edu/download/31450805/what\\_is\\_participatory\\_research\\_.pdf](http://www.academia.edu/download/31450805/what_is_participatory_research_.pdf). [Accessed 18 June 2020].

Corti, C.W., 2003. *Technology is irrelevant to Jewellery Design—or is it?* In Proceedings of the Santa Fe Symposium, pub. Met-Chem Research Inc, Albuquerque, NM, USA. p15–28.

Crouch, C., and Pearce, J., 2012. *Doing Research: From Methodologies to Methods*. In Doing Research in Design (pp. 67–82). London: Berg.Bloomsbury Design Library~ Bloomsbury Design Library 2019. Available from: <http://dx.doi.org/10.5040/9781474294010.ch005> [Accessed 10 June 2020].

Dauritx, L., Remy, N., and Tochtermann, T., 2014. *A multifaceted future: The jewelry industry in 2020*, Mckinsey. Available from: <https://www.mckinsey.com/industries/retail/our-insights/amultifaceted-future-the-jewelry-industry-in-2020> [Accessed 4 September 2019].

Day, K., 2003. *New urbanism and the challenges of designing for diversity*. *Journal of Planning Education and research*, 23(1), pp.83-95.

Dean, L.T. and Niedderer, K., 2016. *Flex-it: Exploring emotional expression through elasticity in digital manufacturing*. *Craft Research*, 7(1), pp. 51–77. Available from: DOI: 10.1386/crre.7.1.51\_1 [Accessed 21 February 2020].

Demarco, F., Bertacchini, F., Scuro, C., Bilotta, E. and Pantano, P., 2020. *Algorithms for Jewelry Industry 4.0*. In: Sergeev Y., Kvasov D. (eds) Numerical Computations: Theory and Algorithms. NUMTA 2019. Lecture Notes in Computer Science, vol 11973. Springer, cham. Available from: [https://doi-org.libproxy.cput.ac.za/10.1007/978-3-030-39081-5\\_37](https://doi-org.libproxy.cput.ac.za/10.1007/978-3-030-39081-5_37) [Accessed 12 July 2020].

Forsman, M. and Solitander, N., 2004. *Knowledge Transfer and Industrial Change in the Jewellery Industry-An Ecologies-of-Knowledge Approach Work in Progress*. Available from: [https://www.researchgate.net/publication/228805859\\_KNOWLEDGE\\_TRANSFER\\_AND\\_INDUSTRIAL\\_CHANGE\\_IN\\_THE\\_JEWELLERY\\_INDUSTRIAN\\_ECLOGIES-OF-KNOWLEDGE\\_APPROACH](https://www.researchgate.net/publication/228805859_KNOWLEDGE_TRANSFER_AND_INDUSTRIAL_CHANGE_IN_THE_JEWELLERY_INDUSTRIAN_ECLOGIES-OF-KNOWLEDGE_APPROACH) [Accessed 24 September 2019].

Fuchs, C., Schreier, M., and Van Osselaer S.MJ., 2015. *The Handmade Effect: What's Love Got to Do with It ?* *Journal of Marketing* 79 (March): 98–110. available from: <https://doi.org/10.1509/jm.14.0018> [Accessed 16 August 2019].

Gregoriotti, G, 2019, *The History of jewellery design*. Encyclopædia Britannica. Available from: <https://www.britannica.com/art/jewelry/The-history-of-jewelry-design#ref14078> [Accessed 02 February 2020].

Gregoriotti, G., 1970. *Jewelry through the Ages*. 2nd ed. New York: American Heritage publishers.

Hague, R., 2006. *Unlocking the design potential of rapid manufacturing*. Rapid manufacturing: an industrial revolution for the digital age, pp.5-18. John Wiley & Sons.

- Harrison, B., 2010. *Gold science and applications*.pg 131-132. 1st Ed. Florida: CRC Press
- Hashim, H. Z., 2018. *Design economic evolution in the jewellery industry*. Journal of Applied and Fundamental Sciences 10, Special Issue 4 (2018). Available from: [https://www.researchgate.net/publication/325313374\\_DESIGN\\_ECONOMIC\\_EVOLUTION\\_IN\\_THE\\_JEWELLERY\\_INDUSTRY\\_THROUGH\\_DESIGN\\_PROCESS](https://www.researchgate.net/publication/325313374_DESIGN_ECONOMIC_EVOLUTION_IN_THE_JEWELLERY_INDUSTRY_THROUGH_DESIGN_PROCESS) [Accessed 4 September 2019].
- Hill, A., 2018. *The jewellery industry's design dilemma*. Forbes. Available from: <https://www.forbes.com/sites/andreahill/2018/08/17/the-jewelry-industrys-designdilemma/#5fd84a7c65ea> [Accessed 4 September 2019].
- Hollway, W., Jefferson, T., 2011. *Producing Data With Defended Subjects In: Doing Qualitative Research Differently*. SAGE Publications Ltd City: London: 27-54. Available from: <https://dx.doi.org/10.4135/9781849209007> [Accessed 15 June 2020].
- Jewellery Council of South Africa, 2019. JCSA Annual Report. Available from: <https://www.jewellery.org.za/jcsa-annual-report-2019/> [Accessed 15 June 2020].
- Jiang, R., Kleer, R. and Piller, F.T., 2017. *Predicting the Future of Additive Manufacturing: A Delphi Study on Economic and Societal Implications of 3D Printing for 2030*. Technological Forecasting and Social Change 117: 87–97. Available from: <https://doi.org/10.1016/j.techfore.2017.01.006> [Accessed 10 August 2019].
- Lico, C., 2014. *Applying 3D Modelling Technology to Traditional Craftwork: Rapid Prototyping in Artisanal Jewellery Making and Its Impact on the Perceived Value of Jewellery*. University of Montreal. Available from: <https://papyrus.bib.umontreal.ca/xmlui/handle/1866/12725?show=full> [Accessed 16 August 2019].
- Lindhult, E., 2019. *Scientific Excellence in Participatory and Action Research: Part I. Rethinking Research Quality*. Technology Innovation Management Review. 9. 6-21. 10.22215/timreview/1237. Available from: [https://www.researchgate.net/publication/333499103\\_Scientific\\_Excellence\\_in\\_Participatory\\_and\\_Action\\_Research\\_Part\\_I\\_Rethinking\\_Research\\_Quality](https://www.researchgate.net/publication/333499103_Scientific_Excellence_in_Participatory_and_Action_Research_Part_I_Rethinking_Research_Quality) [Accessed 3 July 2020].
- MacDonald, C., 2012. *Understanding participatory action research: A qualitative research methodology option*. The Canadian Journal of Action Research, 13(2), pp.34-50. Available from: <https://journals.nipissingu.ca/index.php/cjar/article/view/37> [Accessed 19 June 2020].
- Mackewn, J., 2011. *Facilitation as Action Research in the Moment*. The SAGE Handbook of Action Research, SAGE Publications Ltd: DOI: <https://dx.doi.org/10.4135/9781848607934> [Accessed 27 January 2020].
- Maguire, M. and Delahunt, B., 2017. *Doing a thematic analysis: A practical, step-by-step guide for learning and teaching scholars*. *All Ireland Journal of Higher Education*, 9(3).
- Manavis, A., Nazlidou, I., Spahiu, T. and Kyratsis, P., *Jewellery design and wearable applications: a design thinking approach*. Available from: <https://doi.org/10.24867/GRID-2020p67> [Accessed 20 May 2021].
- Moraes, C., Carrigan, M., Bosangit, C. , 2017. *Understanding Ethical Luxury Consumption*

*Through Practice Theories: A Study of Fine Jewellery Purchases*. J Bus Ethics 145, 525–543 (2017). <https://doi.org/10.1007/s10551-015-2893-9> [Accessed 16 November 2020].

Newman, H., 2015. *An illustrated dictionary of jewellery*, 2nd ed. London: Thames & Hudson.

Norton, E., 2014. *Exploring the Negotiations over the Subcultural Ideology of Authenticity within the Etsy Community*. Universiteit Utrecht. Available from: <https://dspace.library.uu.nl/handle/1874/295480> [Accessed 4 September 2019].

Orlandi, A.C. and Erkan, Y.K., 2015. *Value creation in jewellery fabrication today: exploring the interrelations of crafts and innovation through the case of the grand bazaar of Istanbul*. 11th European academy of design conference. Available from: [http://www.academia.edu/download/53148120/EAD-11-CoskunOrlandi\\_fullpaper.pdf](http://www.academia.edu/download/53148120/EAD-11-CoskunOrlandi_fullpaper.pdf) [Accessed 18 June 2020].

Pain, R., Whitman, G. and Milledge, D., 2011. *Participatory Action Research Toolkit*. Available from: <http://studentsatthecenterhub.org/wp-content/uploads/2015/04/Engaging-YouthResearchers-partoolkit.pdf> [Accessed 23 June 2020].

Parker, C., Scott, S. and Geddes, A., 2019. *Snowball Sampling*. In: P. Atkinson, S. Delamont, A. Cernat, J.W. Sakshaug, and R.A. Williams, eds. SAGE Research Methods Foundations. [online]. DOI: 10.4135/9781526421036831710 [Accessed 5 July 2020].

Pettersson, A., 2019. *Craft in the Age of Digital Reproduction - a Research into Digital Reproduction and Its Aesthetics*. Journal of Jewellery Research 02 (February): 1–17. Available from: <http://www.journalofjewelleryresearch.org/download/annika-pettersson/> [Accessed 16 August 2019].

Pinckernelle, K., 2007. *The iconography of ancient Greek and Roman jewellery*. Doctoral dissertation, University of Glasgow. Available from: <https://eleanor.lib.gla.ac.uk/record=b2632194> [Accessed 24 June 2020].

Prins, P., 2009. *Gems and Jewellery. The South African Handbook*. 1st end. South Africa: Isikhova Publishing and Communication

Rajili, N.A.M., Olander, E. and Warell, A., 2015. *Characteristics of jewellery design: An initial review*. ICoRD'15–Research into Design Across Boundaries Volume 2, pp.613-619.

Scarpitti, C., 2019. *Singular Multiples. Contemporary Jewellery beyond the Digital*. Trento/Barcellona: ListLab. Collana Design Experience. Available from: [https://www.academia.edu/42273936/Singular\\_Multiples\\_Contemporary\\_Jewellery\\_beyond\\_the\\_Digital](https://www.academia.edu/42273936/Singular_Multiples_Contemporary_Jewellery_beyond_the_Digital) [Accessed 24 June 2020].

Schön, D. 1983, *The Reflective Practitioner: How Professionals Think in Action*. London: Maraca Temple Smith.

Sennet, R., 2008. *The Craftsman*. 1st end. London: Penguin Group

Simptani, M. and Barrett, J.E., 2020. Investigating the use of digital technology in Jewellery Design: A thematic analysis. Global Fashion Conference, College of London. Available from: [http://clouk.uclan.ac.uk/36722/1/36722%20SIAMPTANI-BARRETT\\_Investigating-the-use-](http://clouk.uclan.ac.uk/36722/1/36722%20SIAMPTANI-BARRETT_Investigating-the-use-)

ofdigital-technology-in-Jewellery-Design-A-thematic-analysis.pdf [Accessed 28 January 2021].

Skinner, D., 2013. *Contemporary Jewelry In Perspective*. Asheville, NC: Lark Crafts in association with Art Jewelry Forum.

Stewart, S., 2014. *The SAGE Encyclopedia of Action Research*. Chapter: Design Research. Publishing Company: SAGE Publications Ltd. London. Available from: <https://dx.doi.org/10.4135/9781446294406> Print Pages: 246-247 [Accessed 25 October 2019].

Supsomboon, S., 2019. *Simulation for Jewelry Production Process Improvement Using Line Balancing: A Case Study*. *Management Systems in Production Engineering*, 27(3), pp.127137.

Troalen, L.G., Guerra, M.F., Tate, J. and Manley, B., 2009. *Technological study of gold jewellery pieces dating from the Middle Kingdom to the New Kingdom in Egypt*. *ArcheoSciences. Revue d'archéométrie*, (33), pp.111-119. Available from: <http://journals.openedition.org/archeosciences/2095> [Accessed 24 June 2020].

Untracht, O., 2011. *Jewelry concepts & technology*. Doubleday.

White, H., 2004. *Hybrid Practice - Challenging Traditional Craft Boundaries: Authenticity: Anxiety: Autonomy*. *Challenging Craft*, 1–12. Available from: <http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.118.9247> [Accessed 16 August 2019].

Woolley, M. and Niedderer, K., 2016. *Real or unreal?—Crafting authenticity in the digital age*. *Craft Research*, 7(2), pp.159-164. Available from: <https://e-space.mmu.ac.uk/622130/3/CRRE%207.2%20Editorial%20v04%20%281%29.pdf> [Accessed 4 September 2019].

Ziegler, V., 2020. *In between – A Post-Digital Turn*. *Craft-making 4.0*. ISSN 2309-0103, [www.archidoc.net](http://www.archidoc.net) Vol. 7 (2) / February 2020. Available from: [https://www.academia.edu/41891629/Inbetween\\_-\\_A\\_Post-Digital\\_Turn\\_-\\_Craft-\\_making\\_4.0](https://www.academia.edu/41891629/Inbetween_-_A_Post-Digital_Turn_-_Craft-_making_4.0). [Accessed 23 March 2020].

APPENDIX/APPENDICES

**APPENDIX A: RESEARCH ETHICS CLEARANCE LETTER**



P.O. Box 652 Cape Town 8000 South Africa Tel: +27 21 469 1012 Fax +27 21 469 1002 80 Roeland Street, Vredehoek, Cape Town 8001

<b>Office of the Research Ethics Committee</b>	<b>Faculty of Informatics and Design</b>
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8 July 2020

This serves to confirm that ethics approval was granted to MISS CARU GREEFF, student number 208011188, for research activities related to the MTech: Design in the Faculty of Informatics and Design, Cape Peninsula University of Technology (CPUT).

<b>Title of dissertation:</b>	Studio jewellery processes for the post-cyber designer
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Comments

Research activities are restricted to those detailed in the research proposal.

 <b>Signed: Faculty Research Ethics Committee</b>	<b>8 July 2020</b> <hr/> <b>Date</b>
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# APPENDIX B: PARTICIPANT ETHICS DOCUMENTS RESEARCH CYCLE 1



Cape Peninsula  
University of Technology

FID/REC/ICv0.1

## FACULTY OF INFORMATICS AND DESIGN

### Individual Consent for Research Participation

**Title of the study:** Studio Jewellery processes for the post cyber designer

**Name of researcher:** Caru Greeff  
**Contact details:** email: caru.greeff@gmail.com phone: 0716422011

**Name of supervisor:** Monica Di Ruvo  
**Contact details:** email: diruvom@cput.ac.za phone: 0825586659

**Purpose of the Study:** The aim of the research is to explore a basic framework for the appropriate application of digital design technology in the studio jewellers practice.

**Participation:** My participation will consist essentially of interviewee.

**Confidentiality:** I have received assurance from the researcher that the information I will share will remain strictly confidential unless noted below. I understand that the contents will be used only for the M Tech dissertation and that my confidentiality will be protected by the use of pseudonyms.

**Anonymity** will be protected through the use of pseudonyms during this cycle of research. The interview will be recorded with only audio and no video or photographs.

**Conservation of data:** The data collected will be kept in a secure manner on a password protected cloud account. Only the researcher and the supervisor will have access. The original data will be kept until the study is complete and a transcript copy will be stored for audit purposes.

**Voluntary Participation:** I am under no obligation to participate and if I choose to participate, I can withdraw from the study at any time and/or refuse to answer any questions, without suffering any negative consequences. If I choose to withdraw, all data gathered until the time of withdrawal will be destroyed.

**Additional consent:** I make the following stipulations (please tick as appropriate):

	In thesis	In research publications	Both	Neither
My image may be used:	Yes		X	
My name may be used:			X	
My exact words may be used:			X	
Any other (stipulate):			X	

**Acceptance:** I, (print name) \_\_\_\_\_

agree to participate in the above research study conducted by Caru Greeff (*name of researcher*) of the Faculty of Informatics and Design, Design (*name of Department*) at the Cape Peninsula University of Technology, which research is under the supervision of Monica Di Rovu (*name of supervisor*).

If I have any questions about the study, I may contact the researcher or the supervisor. If I have any questions regarding the ethical conduct of this study, I may contact the secretary of the Faculty Research Ethics Committee at 021 469 1012, or email [naidoove@cput.ac.za](mailto:naidoove@cput.ac.za).

Participant's signature: \_\_\_\_\_

Date: \_\_\_\_\_

Researcher's signature: \_\_\_\_\_

Date: \_\_\_\_\_

**Additional consent:** I make the following stipulations (please tick as appropriate):

	In thesis	In research publications	Both	Neither
My image may be used:	✓	✓		
My name may be used:	✓	✓		
My exact words may be used:	✓	✓		
Any other (stipulate):	✓	✓		

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Participant's signature: \_\_\_\_\_ Date: 26-08-2020

Researcher's signature: \_\_\_\_\_ Date: 26/08/2020



**Additional consent:** I make the following stipulations (please tick as appropriate):


	In thesis	In research publications	Both	Neither
My image may be used:			✓	
My name may be used:			✓	
My exact words may be used:			✓	
Any other (stipulate):			✓	

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Participant's signature:  Date: 6 Sept '20

Researcher's signature:  Date: 06/09/2020

**Additional consent:** I make the following stipulations (please tick as appropriate):

	In thesis	In research publications	Both	Neither
My image may be used:	✓	✓	✓	✓
My name may be used:	✓	✓	✓	✓
My exact words may be used:	✓	✓	✓	✓
Any other (stipulate):				

**Acceptance:** I, (print name) \_\_\_\_\_

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Participant's signature: \_\_\_\_\_ Date: 1.9.2020

Researcher's signature: \_\_\_\_\_ Date: 01.09.2020

**Additional consent:** I make the following stipulations (please tick as appropriate):

	In thesis	In research publications	Both	Neither
My image may be used:			✓	
My name may be used:			✓	
My exact words may be used:			✓	
Any other (stipulate):				

**Acceptance:** I, (print name) \_\_\_\_\_

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If I have any questions about the study, I may contact the researcher or the supervisor. If I have any questions regarding the ethical conduct of this study, I may contact the secretary of the Faculty Research Ethics Committee at 021 469 1012, or email naidoo@cput.ac.za.

Participant's signature: \_\_\_\_\_ Date: 29/09/2020

Researcher's signature: \_\_\_\_\_ Date: 29/09/2020

**Additional consent:** I make the following stipulations (please tick as appropriate):

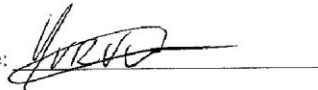
	In thesis	In research publications	Both	Neither
My image may be used:			✓	
My name may be used:			✓	
My exact words may be used:			✓	
Any other (stipulate):			✓	

**Acceptance:** I, (print name) \_\_\_\_\_

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Participant's signature: \_\_\_\_\_



Date: \_\_\_\_\_

29/09/2020

Researcher's signature: \_\_\_\_\_



Date: \_\_\_\_\_

29/09/2020

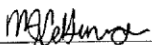
**Additional consent:** I make the following stipulations (please tick as appropriate):


	In thesis	In research publications	Both	Neither
My image may be used:	✓	✓	✓	
My name may be used:	✓	✓	✓	
My exact words may be used:	✓	✓	✓	
Any other (stipulate):	✓	✓	✓	

**Acceptance:** I, (print name) [REDACTED]

agree to participate in the above research study conducted by Caru Greeff (*name of researcher*) of the Faculty of Informatics and Design, Design (*name of Department*) at the Cape Peninsula University of Technology, which research is under the supervision of Monica Di Rovu (*name of supervisor*).

If I have any questions about the study, I may contact the researcher or the supervisor. If I have any questions regarding the ethical conduct of this study, I may contact the secretary of the Faculty Research Ethics Committee at 021 469 1012, or email [naidoo@cput.ac.za](mailto:naidoo@cput.ac.za).

Participant's signature:  Date: 02/10/2020

Researcher's signature:  Date: 02/10/2020

**Additional consent:** I make the following stipulations (please tick as appropriate):

	In thesis	In research publications	Both	Neither
My image may be used:			✓	
My name may be used:			✓	
My exact words may be used:			✓	
Any other (stipulate):				

**Acceptance:** I, (print name) \_\_\_\_\_

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Participant's signature: \_\_\_\_\_

Date: 02/10/2020

Researcher's signature: \_\_\_\_\_

Date: 02/10/2020

**Additional consent:** I make the following stipulations (please tick as appropriate):

	In thesis	In research publications	Both	Neither
My image may be used:				✓
My name may be used:			✓	
My exact words may be used:			✓	
Any other (stipulate):				


**Acceptance:** I, (print name) [REDACTED]

agree to participate in the above research study conducted by Caru Greeff (*name of researcher*) of the Faculty of Informatics and Design, Design (*name of Department*) at the Cape Peninsula University of Technology, which research is under the supervision of Monica Di Rovu (*name of supervisor*).

If I have any questions about the study, I may contact the researcher or the supervisor. If I have any questions regarding the ethical conduct of this study, I may contact the secretary of the Faculty Research Ethics Committee at 021 469 1012, or email [naidoo@cput.ac.za](mailto:naidoo@cput.ac.za).

Participant's signature:  \_\_\_\_\_

Date: 28/08/2020

Researcher's signature:  \_\_\_\_\_

Date: 28/08/2020

## **APPENDIX C: INTERVIEW GUIDELINES RESEARCH CYCLE 1**

### **Interview guidelines for the contextual inquiry**

#### **Introduction:**

Introduce myself and the background of the study.

Explain the purpose of the study.

Address the terms of confidentiality. Ask the interviewee to sign the consent letter.

Ask for a studio tour.

#### **Interview talking points:**

Describe your niche in the market ...

Importance of handmade in your business...

What digital technologies do you currently employ?

Could you describe your process from conceptualization to production ...

Digital technologies available/accessible to you?

Any processes/technologies on your wish list

To what extent can Digital Technology tools be incorporated in the design and manufacturing process of authentic handmade jewellery? – in your opinion...

#### **Conclusion**

Thank the interviewee for their time and contribution

Confirm consent for the data gathered during the interview



## APPENDIX D: PARTICIPANT ETHICS DOCUMENTS RESEARCH CYCLE 2



Cape Peninsula  
University of Technology

FID/REC/ICv0.1

### FACULTY OF INFORMATICS AND DESIGN

#### Individual Consent for Research Participation

**Title of the study:** Studio Jewellery processes for the post cyber designer

**Name of researcher:** Caru Greeff  
**Contact details:** email: caru.greeff@gmail.com phone: 0716422011

**Name of supervisor:** Monica Di Ruvo  
**Contact details:** email: diruvom@cput.ac.za phone: 0825586659

**Purpose of the Study:** The aim of the research is to explore a basic framework for the appropriate application of digital design technology in the studio jewellers practice.

**Participation:** My participation will consist of participants in a co-create workshop.

**Confidentiality:** I have received assurance from the researcher that the information I will share will remain strictly confidential unless noted below. I understand that the contents will be used only for the M Tech dissertation and that my confidentiality will be protected by the use of pseudonyms.

**Anonymity** will be protected through the use of pseudonyms during this cycle of research. The interview will be recorded with only audio and video. Photographs will be taken of the outcomes of the workshop and not participants.

**Conservation of data:** The data collected will be kept in a secure manner on a password protected cloud account. Only the researcher and the supervisor will have access. The original data will be kept until the study is complete and a transcript copy will be stored for audit purposes.

**Voluntary Participation:** I am under no obligation to participate and if I choose to participate, I can withdraw from the study at any time and/or refuse to answer any questions, without suffering any negative consequences. If I choose to withdraw, all data gathered until the time of withdrawal will be destroyed.

**Additional consent:** I make the following stipulations (please tick as appropriate):

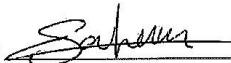
I

	In thesis	In research publications	Both	Neither
My image may be used:			✓	
My name may be used:			✓	
My exact words may be used:			✓	
Any other (stipulate):				

Acceptance: I, (print name) \_\_\_\_\_

agree to participate in the above research study conducted by Caru Greeff (*name of researcher*) of the Faculty of Informatics and Design, Design (*name of Department*) at the Cape Peninsula University of Technology, which research is under the supervision of Monica Di Rovu (*name of supervisor*).

If I have any questions about the study, I may contact the researcher or the supervisor. If I have any questions regarding the ethical conduct of this study, I may contact the secretary of the Faculty Research Ethics Committee at 021 469 1012, or email [naidoo@cput.ac.za](mailto:naidoo@cput.ac.za).

Participant's signature:  Date: 6/09/2021

Researcher's signature:  Date: 08/07/2021

	In thesis	In research publications	Both	Neither
My image may be used:	✓	✓	✓	
My name may be used:	✓	✓	✓	
My exact words may be used:	✓	✓	✓	
Any other (stipulate):	✓	✓	✓	

**Acceptance:** I, (print name) [REDACTED]

agree to participate in the above research study conducted by Caru Greeff (*name of researcher*) of the Faculty of Informatics and Design, Design (*name of Department*) at the Cape Peninsula University of Technology, which research is under the supervision of Monica Di Rovu (*name of supervisor*).

If I have any questions about the study, I may contact the researcher or the supervisor. If I have any questions regarding the ethical conduct of this study, I may contact the secretary of the Faculty Research Ethics Committee at 021 469 1012, or email [naidoo@cput.ac.za](mailto:naidoo@cput.ac.za).

Participant's signature: [Signature] Date: 2021 08 July

Researcher's signature: [Signature] Date: 2021 08 July

	In thesis	In research publications	Both	Neither
My image may be used:			✓	
My name may be used:			✓	
My exact words may be used:			✓	
Any other (stipulate):			✓	

**Acceptance:** I, (print name) \_\_\_\_\_

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If I have any questions about the study, I may contact the researcher or the supervisor. If I have any questions regarding the ethical conduct of this study, I may contact the secretary of the Faculty Research Ethics Committee at 021 469 1012, or email [naidoo@cput.ac.za](mailto:naidoo@cput.ac.za).

Participant's signature: Alundwa Date: 08/07/2021

Researcher's signature: [Signature] Date: 08/07/2021

# Studio jewellery processes for the post cyber designer

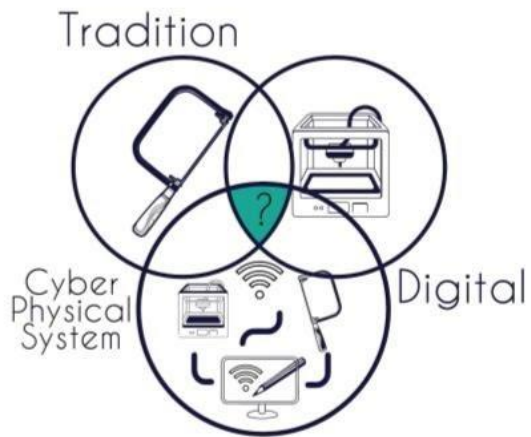
Co-create workshop

08/07/2021

## Background

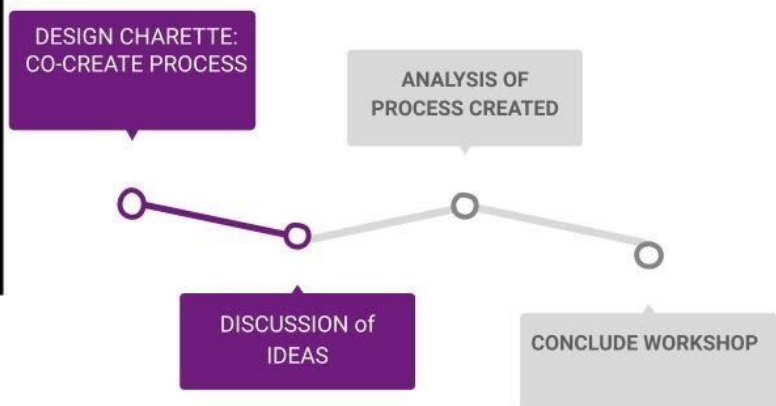
*Literature reveals that in the current digital age, technology is developing at a rapid pace, and that in the future manual jewellery design and manufacture processes could be eliminated completely. To date however, there are no jewellery making processes that exclude manual labour entirely. The rapid development of technology could impact the future sustainability of the studio jeweller in their ability to remain viable in terms of price, time, material consumption, variety and complexity of design afforded by digital processes. The importance of handmade and the preservation of high quality handmade jewellery for the future is essential for the studio jeweller.*

## Aim

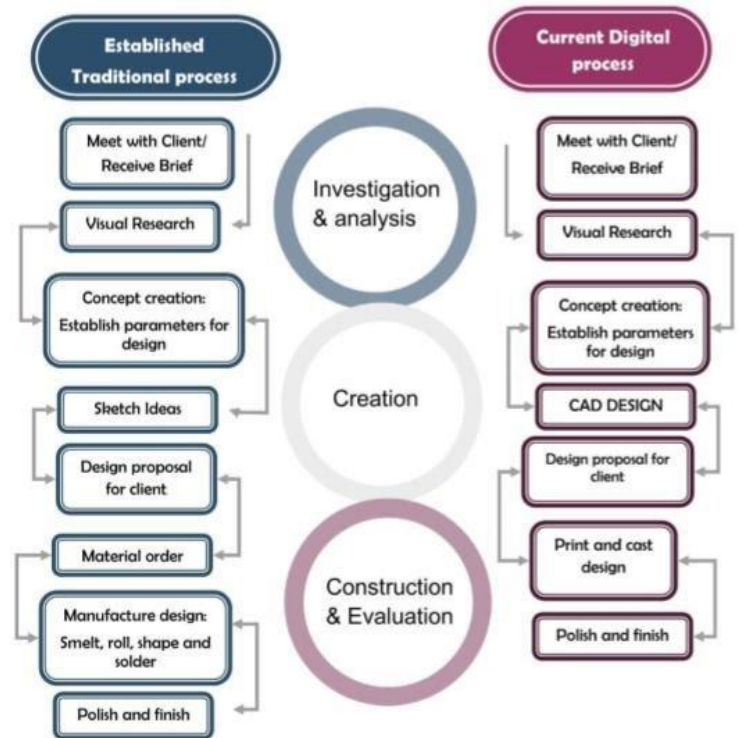


Aim of the workshop is to create and develop a process that is appropriate for the future post cyber studio jeweller to mitigate the complexities of incorporating digital design technology into the traditional process associated with the handmade jewellery piece.

## How?



## What we know...



## Design problem

How can we incorporate new tools and processes into the traditional design process of handmade jewellery?

### The new process should:

- Produce a handmade piece
- *Designomic costing*
- *Highest quality and intrinsic value*
- *Design freedom*



## Tools

Meet with Customer in person.

Customer supplies visual aids and/or stones

Visual research: images

Pencil ideation sketch

Construction planning sketch

Smelting

Wax carving

Rolling/shape and form

Solder/joining of pieces

Decorative Techniques application

Finishing and polishing

User selection interface

Social media

Online store

Digital Sketching tools

CAD design Lithographic drawing

Photoshop

Rendering software

CAD Model in wax

CAD model for casting

Wax Mould

Laser welding

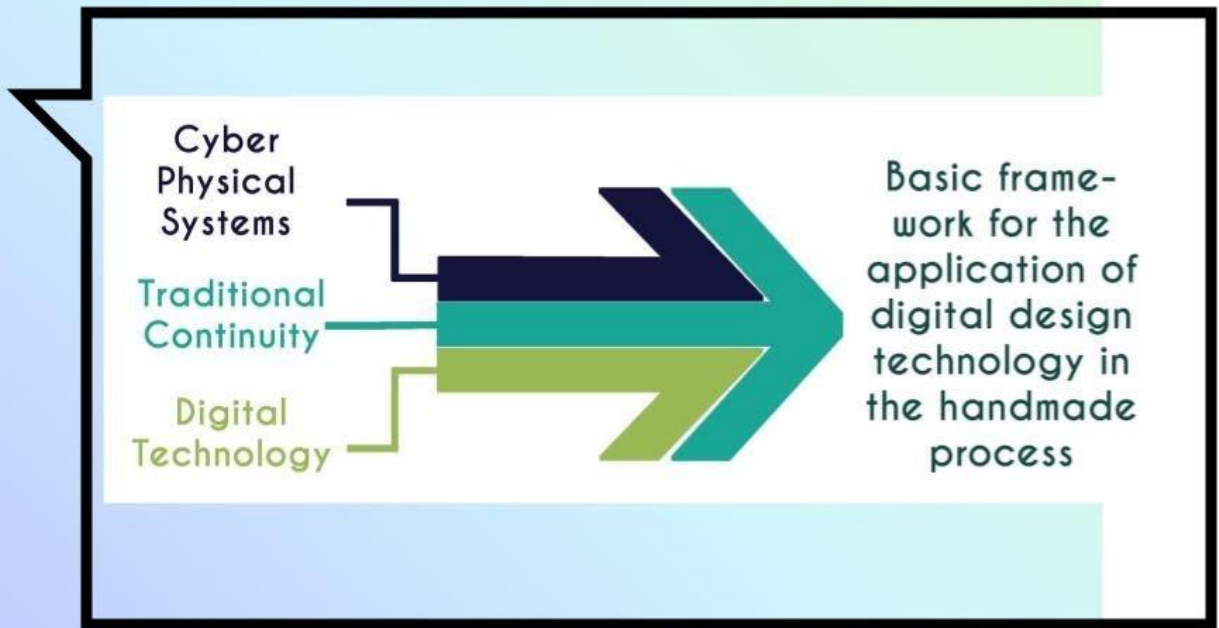
Metal printing

Polishing and finishing

## Theoretical structure of process:







**Analysis:**

	Handmade	Designomic	Quality and intrinsic value	Freedom of Design
PROCESS 1				
PROCESS 2				
CONCLUSION				

